ISIS

International Review devoted to the History
:: of Science and Civilization ::
Quarterly Organ of the History of Science Society and of the International Academy of the History of Science.

SUMMARY

of No. 78 (Vol. XXIX, 1)

306 p., 4 pl., 11 figs.

Published in July 1938

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Preface to Volume Twenty-Nine

... primum herbam deinde spicam deinde plenum frumentum in spica.

First the blade

The idea of the history of science has occured to many minds in the past centuries, already as early as the fourth B.C. and repeatedly afterwards, especially whenever great discoveries opened new vistas and justified new dreams and new hopes.. Thus in the eighteenth century, the century of "enlightenment", the ideas of "progress" and of "history of science" developed together. A number of scientists and philosophers composed books to which the modern historian of science turns with eagerness, hoping to find in them what their title seems to promise, only to meet with disappointment after disappointment (1). Some of these books (e.g., Priestley's) contain valuable information with regard to recent achievements and good chronicles of contemporary discoveries, but their knowledge of the distant past is generally poor and their perspective out of focus. These writers as a class had more enthusiasm for science than real historical understanding, not to speak of historical method of which they were

(1) Here are a few titles by way of illustration. Charles Noblot (1668-c. 1742) : *L'origine et les progrès des arts et des sciences* (Paris 1740). Maupertuis (1698-1759) : *Lettre sur le progrès des sciences* (Paris 1752). Alexandre Savérien : (1720-1805) : *Histoire des progrès de l'esprit humain dans les sciences exactes et dans les arts qui en dépendent* (4 vols., Paris 1766-78). Joseph Priestley (1733-1804) : *The history and present state of electricity with original experiments* (London 1767, again 1769; 1775); *The history and present state of discoveries relating to vision, light and colours* (London 1772).

And many more, not forgetting the encyclopaedias. For the study of that early historiography consult Carl von Klinckowstroem : Die Anfänge der physikhistorischen Forschung (*Archivio di storia della scienza*, vol. 4, 113-22, 1923). Bertha Bessmertny : Alexandre Savérien (*Archeion* vol. 15, 369-78, 1933).

innocent. Their idea of the history of science was still very crude and egocentric. It is as if they had been asked the questions : "How can you be so learned and so wise? How did you manage to reach such peaks of knowledge?"... and they proceeded to answer with volubility, confusing history and science, past and present. The work of MONTUCLA (2) may be considered the climax of that naive and clumsy historiography as well as the beginning of a new kind.

After the Revolution and the Napoleonic Era, when the torches were out and there remained nothing but their smoke and stench, when the glamour was vanishing, and the innumerable crimes as well as the prodigies of heroism were receding into the outer darkness, when there was nothing left but to repair the damages and pay the debts, the minds were sobered, and the conceit of the "age of enlightenment" was knocked out, but not for very long. The Romantic Age introduced new exaltations, even in the field of science, dreams of harmony and unity, which were not by any means all of them idle dreams, for they led to some of the great physical discoveries of the century. The early type of historiography continued, as it was bound to, for egocentric tendencies are natural enough, and there will always be plenty of vain and pompous people, anxious to explain to others the glory of their own genealogy, the development of their wealth, or the genesis of their wisdom. However, new points of view were introduced by such men as AUGUSTE COMTE (1830-42), HENRY THOMAS BUCKLE (1857-61) and ANTOINE AUGUSTIN COURNOT (1861); and WILLIAM WHEWELL (1837) began to write the history of science in a more orderly and disinterested fashion. As might be expected the most valuable work was done by historians of special sciences, for example by HERMANN KOPP in his *Geschichte der Chemie* (1843-47), and higher standards of objectivity, comprehensiveness, and accuracy were gradually introduced by a small group of special historians, as PAUL TANNERY (d. 1904) and MORITZ CANTOR (d. 1920), to mention two of the greatest whose magnificent efforts extend almost to our own days. Thanks to the devotion of those men, by the end of last century the study of the history of science was already well launched, but the teaching was hardly

(2) G. SARTON : MONTUCLA (*Osiris* 1, 519-67, 1936).

begun and the work continued to be done almost exclusively by amateurs.

Then the Ear

Though there were probably a few anterior initiatives (3) we may say that the teaching of the history of science is a creation of this century. How strange it will seem later on to our distant descendants that it took so long for man to discover the philosophical and educational value of these studies. Indeed by the end of last century, historical disciplines of almost every kind were already firmly established, each with its own methods and traditions, and yet the teaching of the history of science was still considered a fantasy and luxury. Such a paradoxical situation can be explained only in this way : modern science blossomed out with an intensity and luxuriance contrasting violently with the leisurely development of ancient learning; the spirit of science seemed to be (and often was) antagonistic to that of earlier studies. The scientist was so completely bent on the future that he was unable to look backward. He was moving forward so fast that he had no time or patience with tradition and to all appearances he behaved like an iconoclast and a savage. He would not study history, or if he tried, he failed to do it well because neither his mind nor his heart were attuned in the proper manner.

Under such discouraging auspices it is not surprising that the teaching was introduced so late, and that when it was finally organized, it was organized so badly. It was first thought that any scientist, having a modicum of historical and philosophical curiosity, was qualified ipso facto to teach the history of science; and if he was a distinguished investigator, he seemed eminently qualified. That fundamental error could have been avoided if one had paid more attention to similar experiences in other fields, for the paradoxical conflict between creation and criticism extends to every domain. Famous generals, for example, are not necessarily good military historians, neither are they necessarily bad ones. The point is that their military genius does not imply the capacity to analyze correctly the military achievements of

(3) There were many more with regard to the history of special sciences, such as mathematics or medicine.

other people, not to speak of the many other qualities which are needed for historical investigations and for the exposition and discussion of their results in spoken or written form. Great composers have proved over and over again their almost complete inability to write good histories of music, and thus it has been left to musical amateurs or to musicians without creative power to write them. The paradox is even more startling in the case of disparaging criticism. When the musical critic speaks ill of a composition, its author might well say to him, "Could you do as much?" No, he could not, yet he may be far abler to judge than if he could. The ability to achieve is one thing, the ability to criticize the achievement and to see it in its correct historical perspective, is another. These two abilities are always different and not seldom conflicting. Thus a scientist, however eminent, is not necessarily a good historian of science. Should he have in him the requisite qualities, he might become one but only if he were prepared to take endless pains.

College deans who intrust courses on the history of science to unprepared scientists cannot expect any valuable teaching, yet if these scientists be sufficiently interested in the history and philosophy of science they may succeed in transmitting, however imperfectly, a tradition which they are themselves unable to fulfill, and to that extent their courses may be useful. After all, is not that the way everything began? — the pioneering of dilettanti, the well-meant efforts of extemporized teachers? In spite of their ignorance the latter may be genuinely inspired; and if they are sufficiently honest to realize their ignorance, and sufficiently humble, they may even guide their students up to heights which they themselves would have been unable to reach. Thanks to the efforts of such men, whether their historical efforts be good, bad or indifferent, the teaching of the history of science is now well launched, a new historical tradition — which may redeem science out of its crudities — is being slowly established, and a new profession is carefully initiated.

After that the full corn in the ear

Within recent years it has finally been understood by a few educators and administrators that the history of science cannot

be expected to develop soundly on any other basis than other historical studies. Irrespective of his intelligence and of his achievements in other fields, no man will ever be able to improve our knowledge of, say, American history, or even to teach it sufficiently well, without a long preparation ad hoc. Any intelligent person, of course, can understand American history and enjoy reading books on the subject, but without preparation he is unable to appreciate these books correctly, or to extract from them what is good and new. In the same way any intelligent scientist can understand the history of science and enjoy reading books on the subject, but without preparation he cannot decide what is right and what is not, nor produce himself valuable contributions (4).

To give a correct and verifiable account of past events is always difficult; it requires special gifts and a special technique which cannot be mastered except after many exertions and long experience. To appreciate these events is even more difficult; it requires not only a very complex training, but wisdom. To find the truth in any field is extremely difficult, and no worthy scholar will ever be satisfied with less than what is actually obtainable.

What is the good of knowing, or writing, or teaching things that are not so? Is that not a loss of time, or worse? When we are beginning to be interested in the history of science, we want to know as much of it as possible, and in our eagerness we are at first satisfied with almost any kind of history. Then as we know more, we become more critical and harder to please. We want good history, good and pure, the best available, and that best, we hope, is only a stepping stone for something which will be better still. Though the subject of our studies is in the past, we are bent forward even as the scientist himself; that is, we can only be satisfied with the latest stage of knowledge, or with the next stage (not the previous one), with knowledge more nearly complete and permanent.

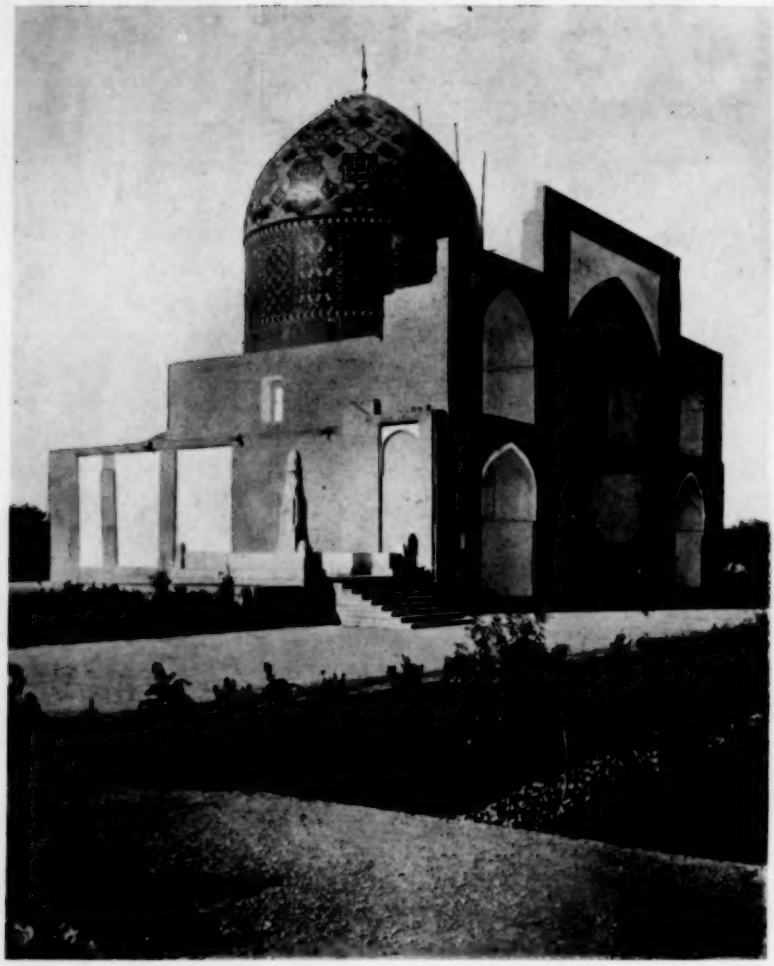
As soon as that point of view has been reached — and it is being reached by quite a few historians of science — we may say that we are "saved", or at any rate that we are on the right

(4) Except autobiographical reminiscences, which are not history, but rather materials for the historian. They may be materials of the very first order, regardless of the writer's historical preparation or the lack of it.

track, — from which there is no coming back; only going ahead, however slowly, however humbly.

The "full corn in the ear" is ripening for those who are sufficiently well trained, honest and patient. It is not necessary that there be very many, but there should always be a few to defend the best traditions of scholarship and to promote the gradual unveiling of the truth in that field as in any other. There should always be a few guardians of the temple, resourceful, enduring and courageous, ready to drive out of its precincts the liars, the vainglorious parasites and the prostitutes who would live of it instead of for it. The "full corn in the ear" is the truth which consecrated men are patiently disengaging from its gangue of misunderstandings and errors, and which, as soon as it is discovered, must be constantly protected from contaminations and adulterations. For it is not enough to search for the truth, and eventually to find it, or to find a parcel of it, or to come nearer to it; whatever is found must be kept fresh and pure, lest it perish, and this can be accomplished only at the price of incessant and generous efforts. The obtainment and preservation of truth postulate infinite devotion, but there is no greater service which a man can render to his brethern.

Westover, North East Harbor, Maine
July 12, 1937. GEORGE SARTON.



The Tomb of Omar Khayyâm in Nîshâpûr

(Courtesy of Metropolitan Museum, New York)

UNIV. OF MICH.

The tomb of Omar Khayyâm

The great poet and mathematician Abû-l-Fatḥ 'Umar ibn Ibrâhîm al-Khayyâm was born in or near Nîshâpûr at an unknown date, but he was already famous as a mathematician in 1074, when Malik Shâh invited him to reform the Iranian calendar. He seems to have spent most of his life in Nîshâpûr and he died there; the most probable date of his death is 526 = 1131-32 (not 1123-24, as I said in my *Introduction* 1, 759).

Nîshâpûr, the most important of the four cities of Khurâsân (the three others being Marw, Herât and Balkh), was one of the leading Iranian cities in mediaeval times. Its prosperity dates from the ninth century and reached its climax in the eleventh century under the Saljûq (Turkish) dynasty the rule of which began in 1037, especially under Alp Arslân (1063-72) and Malik Shâh (1072-92), already mentioned, and their brilliant vizier Niẓâm al-Mulk (1). There were at that time in the city a number of colleges (madâris) and at least thirteen libraries, one of which contained five thousand volumes. It was thus a real intellectual center, indeed one of the greatest in that part of the world. It was the birthplace of Omar Khayyâm, and later of the great Ṣûfî poet Fârid al-dîn 'Aṭṭâr (2). Indeed even before Omar Khayyâm it was already famous as a center of learning, and Abû 'Abdallâh al-Baiyi' al-Nîshâpûrî (who died in 405 = 1014-5) (3) wrote a history of the 'ulamâ (i. e., the learned men) of his native city extending to eight volumes.

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(1) Abû 'Alî al-Ḥasan ibn 'Alî (1018-92). See my *Introd.* (1, 780) where his title (under which he is best known) is unfortunately misspelled. It ought to read Niẓâm al-mulk.

(2) Died c. 1229. *Introd.* 2, 601.

(3) I quote that writer after Honigmann (1935) but cannot identify him. Honigmann says he died in 405 = 1041; one of these dates is certainly wrong. I assumed the first to be correct.

After the eleventh century, Nîshâpûr was subjected to a series of calamities. In 1145 it was devastated by an earthquake; nine years later it was partly destroyed by the Ghuzz—a Turkish horde—and its libraries were burned and sacked (4). It was repeatedly afflicted with wars and rebellions (e. g., in 1207), suffered more earthquakes (1208, 1280), and finally in 1221 the Mongols led by CHINGIZ KHÂN sacked it completely. Yet Nîshâpûr would not die, and when ḤAMDALLÂH MUSTAWFÎ visited it (c. 1340), and IBN BAṬṬÛṬÂ again a few years later (c. 1350) they found it had to some extent recovered. Of course, earthquakes and plunder would destroy houses and property, they could not destroy the geographical causes of commercial success, and the devastated city would soon be rebuilt in a different quarter.

Nevertheless it is very remarkable that these reiterated catastrophes did not obliterate OMAR's tomb, and the more so that the latter being a Sunnî, and a very strange one at that, could not be very popular in his own country.

The tomb continued to be shown throughout the centuries; Sir PERCY MOLESWORTH SYKES visited it in our time and so did the great American Iranist, A. V. WILLIAMS JACKSON (in 1907-8). The latter's account of it being particularly good, we quote from it the following remarks (p. 241 in his book of 1911):

"... All this time, as we drove along, the turquoise dome of the Mosque of the Imam-zadah MAHRUK, which OMAR's grave adjoins, had been glancing ever nearer on the view. The delicate greenish blue of its vaulted dome, encircled by arabesque scrolls in yellow and white, had come out clearer and clearer to the eye. A few minutes more and we were at the gate of the white-walled enclosure around the precinct, over which high waving trees bowed salutation as we drove up. Upon reaching the arched portal of the entrance, a mass of emerald bushes and yellow flowering shrubs, amid a profusion of rose-blossoms, burst upon the view. It was a truly typical Persian garden, with roughly outlined walks and stone-coped water-courses, and with shade-trees and flowers on every hand. I thought of the story told by NIZAMI of Samarkand, a devoted disciple of OMAR, who had visited his master's grave some years after the great man's

(4) CHARLES SCHEFER: *Sefer nameh. Relation du voyage de Nassiri Khosrau* (Paris 1884, appendix p. 281). NÂṢIR-I-KHUSRAW (1003-88) was a Persian traveller, a contemporary of OMAR KHAYYÂM, and hailing from the same country Khurâsân, but from another town, Marw. He does not speak of OMAR, but that is not very surprising as he was an Ismâ'îlî and OMAR, a Sunnî. See my *Introduction* (1, 768).

death, in 1123, and who told the story of OMAR's prophecy that his grave would be where flowers in the springtime would shed their petals over his dust..."

" ... We turned to the left, as did NIZAMI of Samarkand eight hundred years ago, and approached the spot where rests the dust of him who gave expression in quatrain poetry to Persia's freest thought. Though at the end of the garden wall, OMAR's grave is now beneath an arched wing that has been added to the left of the Mosque of the Imam-zadah MUHAMMAD MAHRUK, a Moslem saint of the eighth century A. D., who was martyred fully three hundred years before OMAR's time. The present edifice, which serves as the saint's mortuary shrine, appears to have been erected in the seventeenth century, probably to supplant a dilapidated building, and it is a place of pious pilgrimage for the faithful of Islam. We paid little attention to the sanctuary, however, for the grave of OMAR was the only object of interest to us. The sarcophagus stands beneath the central one of three arched recesses, its niche measuring about thirteen feet across, while the flanking arches measure about ten feet each and are empty. A couple of terraced brick steps lead up to the flooring where it rests. The oblong tomb is a simple case made of brick and cement, the poet's remains reposing beneath; and, although there is no inscription to tell whose bones are interred below, every one knows that it is OMAR's grave. Vandal scribblers (found in Persia as in every other land) have desecrated it with random scrawls and have also scratched their names upon the brown mortar of the adjoining walls, thus disclosing the white cement underneath. A stick of wood, a stone, and some fragments of shards profaned the top of the sarcophagus when we saw it. There was nothing else..." (5) (pp. 242-43).

The author concluded (p. 244): " It is to be regretted that some of OMAR's admirers in the Occident do not provide a suitable inscription on the spot to show the renown he enjoys in the West. However, the site where he rests, like the tombs of HAFIZ and SA'DI at Shiraz, is preserved from forgetfulness by the mosque which it adjoins. In this respect it is not like that of the great epic poet FIRDAUSI, which is practically forgotten amid the ruins of Tus. It is safe to predict, moreover, that OMAR's growing fame in Europe and America will bring other pilgrims to his grave."

Our readers will be pleased to know that Professor JACKSON's wish has been realized. The Iranian government took advantage of the FIRDAWSÎ's millenary (Oct. 1934) which was celebrated all over the world as well as in Iran, to erect a new monument of white marble over OMAR KHAYYÂM's tomb.

It so happens that the Metropolitan Museum had been authorized to excavate (in 1935 and 1936) at Nîshâpûr. One of the sites entrusted to the American archaeologists was the mound Sabz Pûshân, within sight of the shrine of MUḤAMMAD MAḤRÛQ,

(5) A comparison of JACKSON's description and of the photographs given by him (opposite p. 242) with the photograph which we publish shows that the arched recesses and the sarcophagus have been suppressed and the wall of the mosque rebuilt. The new monument is now decidely outside of the mosque, and not as it was before a part of its outside wall.

and among the admirable photographs which they brought back to New York there is one which represents that shrine and the new monument. Thanks to the courtesy of the Museum and of the leader of its Islamic department, Mr. M. S. DIMAND, I am enabled to publish that very photograph in *Isis*.

The following information extracted from Mr. C. W. WILKINSON's report will also interest our readers (p. 21):

"The Governor of Nîshâpûr, wishing to draw the attention of travelers to the burial place of 'OMAR KHAYYÂM, which is situated in the garden of the shrine of MUḤAMMAD MAḤRUK, changed the course of the Mashhad road and between Nîshâpûr and the shrine planned a *falakeh*, a circular place, adorned with a flower garden and rest house. At the opening of the branch road to the tomb he has erected a pair of brick columns with several quatrains of the poet in glazed tiles thereon. On leveling the ground he found numerous old bricks and other debris of ancient building, together with innumerable potsherds. He asked whether we would care to clear the site to prevent any archaeological information from being irretrievably destroyed. Our men rapidly cleared the area, which, though it yielded several interesting fragments, did not produce anything of importance. It was, however, most gratifying to find the local authorities so willing to co-operate in our efforts to add to the knowledge of ancient Nîshâpûr, for such collaboration is most definitely of mutal advantage. The Iranians are extremely proud of their past."

The memory of OMAR KHAYYÂM is thus secure, even in his own country, and this is very gratifying and more unexpected than most people would imagine. Indeed if OMAR was nominally a Sunnî, he was very far from being orthodox, and no devout Muslim could read his quatrains if he did read them at all, without being alarmed. His poetry savours of free thought, rebellion, and heresy. I remember that having been invited to deliver a lecture on Arabic science before the Muslim community of Beirût in the Muslim College of that city (March 16, 1932), I spoke with some enthusiasm of the astounding algebraical achievements of the great Persian poet. A few days later I received a visit from a Muslim group of people and after the usual courtesies, I realized that their main purpose was to warn me against that dangerous man, that corrupter of religion and morality, whom I had so imprudently extolled.

The vindication of OMAR's fame in Muslim lands is a triumph of reason over Muslim fanaticism, it is a triumph of international thought over sectarianism. Praise to the new Iran for having consecrated the fame of one of her noblest sons, one who is so

great that he belongs not to her alone but to the whole of humanity.

December 6, 1937. GEORGE SARTON.

BIBLIOGRAPHY

Major P. M. SYKES : A pilgrimage to the tomb of OMAR KHAYYAM (*Travel and exploration*, vol. 2, 129-38, 1909).

A. V. WILLIAMS JACKSON : *From Constantinople to the home of* OMAR KHAYYAM (New York, MACMILLAN, 1911, chapter 18, pp. 240-45).

Both SYKES' and JACKSON's accounts contain photographs showing the desolate aspect of OMAR's tomb at the time of their visits. SYKES gave a better description of the country between Mashhad and Nîshâpûr.

G. SARTON : *Introduction to the history of science*. Vol. 1. *From* HOMER *to* OMAR KHAYYAM (Baltimore 1927, 759-61).

E. HONIGMANN : Nîshâpûr (*Encyclopaedia of Islam*, vol. 3, 928-9, 1935).

E. MINORSKY : OMAR KHAIYÂM (*ibidem*, vol. 3, 985-9, 1935).

M. S. DIMAND, C. K. WILKINSON and others : The Iranian expedition, 1936 (Section II of the *Bulletin of the Metropolitan Museum of Art*, vol. 32, no. 10, October 1937, 40 p., illustrated).

Souvenirs concernant le Géomètre Yougoslave Marinus Ghetaldi,

conservés à Doubrovnik, en Dalmatie (1)

MARINUS GHETALDI vécut de 1568 à 1626.

Je me suis intéressé à tout ce qui concerne ce géomètre, à cause de la question des fondateurs de la géométrie analytique, dont je me suis occupé.

GHETALDI succéda immédiatement à VIÈTE, qui fut le créateur de l'algèbre, une des parties essentielles pour la géométrie analytique. VIÈTE, comme on le sait, n'était pas professeur. Conseiller du roi HENRI IV, le seul élève qu'il eut fut précisément GHETALDI, qui participa à l'édition des œuvres de VIÈTE. Rentré après à Doubrovnik, GHETALDI s'y consacra à la continuation de l'œuvre de VIÈTE, c'est-à-dire l'application de l'algèbre à la géométrie, qui devait permettre de résoudre les problèmes géométriques par les méthodes algébriques.

GHETALDI a publié plusieurs travaux à ce sujet, qui sont bien conservés et qui figurent dans plusieurs bibliothèques, notamment en Yougoslavie (2).

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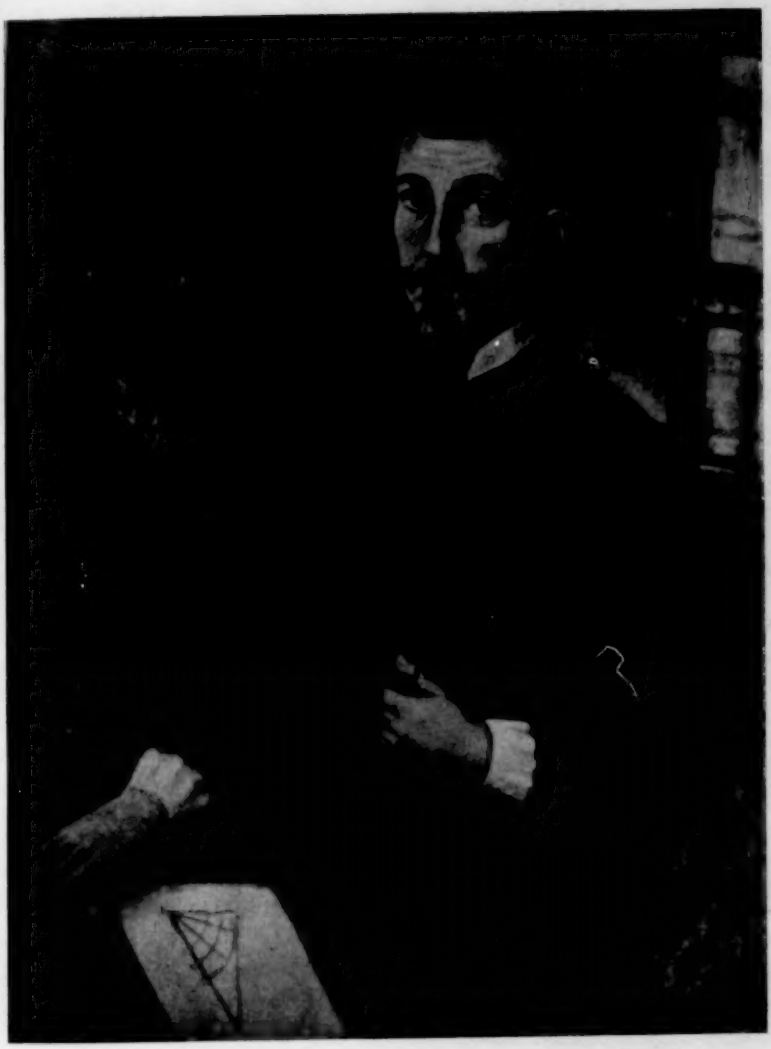
(1) Communication faite devant le Comité belge d'histoire des sciences à Bruxelles, le 6 février 1937.

(2) Une analyse détaillée de l'œuvre de M. GHETALDI a été faite par EUGEN GELCICH dans un article très documenté : *Eine Studie über die Entdeckung der analytischen Geometrie mit Berücksichtigung eines Werkes des Marino Ghetaldi Patrizier Ragusaer* (Abhandlungen zur Geschichte der Mathematik, Viertes Heft, Leipzig, février 1882. Suppl. zur hist.-lit. Abth. d. Zeitscht. f. Math. u. Phys.). GELCICH y avait corrigé toutes les erreurs qui se sont introduites dans maints Traités d'histoire des Mathématiques sur la part de GHETALDI dans la création de la Géométrie analytique.

On consultera avec fruit de même l'article de M. H. WIELEITNER. *M. Ghetaldi und die Anfänge der Koordinatengeometrie.* (Bibliotheca Mathematica, 133, 1912-1913, p. 242.



MARINUS GHETALDI

N. SALTYKOW.

UNIV. OF MICH.

En étudiant la question dont je vous parle, mon attention s'est portée surtout sur les détails de la vie de ce géomètre.

J'ai tenu à aller à Doubrovnik, car j'avais appris qu'un portrait de lui, encore inédit, s'y trouvait en possession de M. SARAKA, patricien de Doubrovnik, l'un des descendants de Marinus GHETALDI (3).

En intervenant personnellement auprès de l'intéressé, je suis parvenu à prendre une photographie du portrait de GHETALDI ci-joint. Un exemplaire de cette photographie se trouve à l'Institut Mathématique de l'Université de Belgrade. Mr. PELSENEER a bien voulu se charger de placer un autre exemplaire dans la belle collection de portraits que possède l'Université de Bruxelles.

Étant à Doubrovnik, je suis allé voir tout ce qui rappelait l'éminent géomètre.

Doubrovnik, c'est l'ancienne Raguse. Au temps de GHETALDI, c'était une petite république patricienne, vivant sa vie propre à côté de la République de Venise, tellement plus considérable.

Si les renseignements concernant GHETALDI ont été conservés presque intacts dans l'actuelle Doubrovnik, c'est parce qu'une grande partie de cette ville constitue un véritable musée. Chaque maison des anciennes familles patriciennes qui gouvernaient autrefois la petite république, renferme des indications précieuses sur la vie passée de ceux qui l'habitèrent.

L'ancienne propriété des GHETALDI se trouve dans la ville hors les remparts des anciennes forteresses. Les particuliers qui y demeurent admettent que les visiteurs y pénètrent. La maison est entourée d'anciens murs. Une inscription latine, gravée au-dessus de la porte d'entrée, dit à peu près : " En entrant ici, on doit abandonner les envies, les disputes, les soucis. La paix et la quiétude sont assurées par ce beau jardin." Le sens de ces paroles apparaît clairement aujourd'hui. GHETALDI était un patricien et participait, de ce fait, au gouvernement de la République de Raguse (c'est pour cela que la date de sa naissance est connue, la République enregistrant régulièrement tous les actes de la vie des familles patriciennes. Leurs membres, dès l'âge de vingt ans, faisaient partie du Conseil supérieur de l'État). Le

(3) Dans l'édition « Galleria dei illustri Ragusei » se trouve une gravure de M. GHETALDI qui a été gravée d'après ce portrait.

nombre des patriciens n'était pas grand ; ils devaient donc prendre une part très active à la politique du pays. GHETALDI lui-même était souvent envoyé en mission, soit à Venise, soit à Constantinople, soit à Vienne. La petite république de Raguse ne conservait sa liberté qu'au prix de négociations perpétuelles avec les pays plus grands qui l'entouraient. GHETALDI menait donc une vie très agitée et, lorsqu'il rentrait chez lui, entre deux missions, il désirait abandonner tout souci et se livrer en paix à des méditations scientifiques.

A l'entrée de la propriété est située une chapelle, suivant la coutume de l'époque. Elle est restée telle qu'elle était au temps de GHETALDI ; on y voit notamment une image de la Vierge qui lui appartenait. En face de la chapelle est la maison, reconstruite d'après l'ancienne. Elle est de dimensions exiguës parce que construite sur une grotte, non loin de la mer. Une centaine de marches mènent à cette grotte, qui fut le laboratoire de GHETALDI. Non seulement mathématicien, mais également physicien, il procédait à des expériences, notamment sur la lumière, laquelle pénétrait à flots dans la grotte par une ouverture qu'il y avait fait pratiquer. Cette grotte est connue, jusqu'à présent, sous le nom de " Grotte du Sorcier," parce que GHETALDI, en procédant à des expériences inspirées d'ARCHIMÈDE, allumait les rayons solaires qui pénétraient dans sa grotte et, en les réfléchissant avec des lentilles, il enflammait parfois les petits bateaux qui passaient à proximité. La crainte naquit chez les pêcheurs, et la grotte fut baptisée.

On a conservé et imprimé tous les travaux de GHETALDI, sauf ceux qui concernent ses expériences de physique. Malheureusement, les manuscrits manquent. Mais, quant à la vie de GHETALDI, de nombreux documents existent dans les archives gouvernementales. Ces archives se trouvent dans la Maison des Princes, comme on l'appelle, qui est l'ancien Palais du Gouvernement que le feu roi ALEXANDRE Ier a légué pour y placer les archives. L'on y trouve, notamment, le testament de GHETALDI. En quelques minutes, grâce à l'organisation parfaite de ce service, je fus en possession d'une photographie de ce document intéressant. On apprend ainsi que les légataires de GHETALDI furent ses trois filles et que la génération masculine de sa famille s'éteignit avec lui. La branche féminine est représentée aujourd'hui par la

famille SARAKA. C'est l'un de ses membres qui me donna l'autorisation de photographier le portrait de GHETALDI, lequel est malheureusement en assez mauvais état et n'a jamais été restauré.

Le testament de GHETALDI a retenu mon attention parce qu'il permet de se faire une idée assez complète de ce qu'était la vie à son époque. GHETALDI désigna, comme tuteurs de ses trois filles, ses deux frères, leur laissant pour mission de veiller sur elles, de les marier si possible, ou bien de les placer dans un couvent. Il les charge aussi de partager sa fortune entre ses filles, à leur convenance, suivant la coutume. D'autres légataires sont cités dans le testament : ce sont les trois églises de Doubrovnik, tous les serviteurs de la famille, et des parents assez éloignés. Il va même jusqu'à insister auprès de ses frères pour qu'ils remplissent la promesse qu'il a faite à une quatrième église de lui donner un calice d'or, promesse qu'il n'a pas eu le temps d'exécuter.

Le testament de GHETALDI indique qu'il est mort le 7 avril 1626. Les bords du document portent les signatures de tous les légataires, qui ont ainsi attesté avoir reçu les sommes ou les dons qui leur revenaient.

Les archives gouvernementales contiennent également un livre où sont consignées toutes les missions que les patriciens devaient remplir suivant les ordres du gouvernement. GHETALDI en eut beaucoup pour sa part.

Belgrade. N. SALTYKOW.

Descartes et le théorème de Poincaré

(A propos de la question des précurseurs).

C'est en 1890 que POINCARÉ, se basant à la fois sur des résultats dus à MAXWELL et sur une propriété des équations canoniques de LAGRANGE — propriété dont ce dernier semble n'avoir aperçu ni la signification ni la portée — a donné, dans l'introduction de son traité d'*Electricité et Optique*, la démonstration du théorème suivant, qui marque une date fondamentale dans l'histoire des théories physiques :

" *Si... un phénomène comporte une explication mécanique complète, il en comportera une infinité d'autres qui rendront également bien compte de toutes les particularités révélées par l'expérience* " (1); ce théorème, on le sait, conduisait en quelque sorte à une attitude intermédiaire entre celle de LAPLACE et celle que ABRAHAM et LORENTZ, s'autorisant du résultat acquis par POINCARÉ, allaient bientôt adopter.

Nous voudrions attirer l'attention sur le fait que l'énoncé de ce théorème a été donné en réalité, sous une forme générale, dès 1644, dans l'édition latine des *Principia Philosophiae* de DESCARTES (2) (quatrième partie, § 204) :

" At quamvis fortè hoc pacto intelligatur, quomodo res omnes naturales fieri potuerint, non tamen ideò concludi debet, ipsas revera sic factas esse. Nam quemadmodum ab eodem artifice

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(1) HENRI POINCARÉ, *Electricité et Optique. I. Les théories de Maxwell et la théorie électromagnétique de la lumière. Leçons professées pendant le second semestre* 1888-89. Paris, CARRÉ, 1890; p. XIV. Ajoutons que l'on doit à KOENIGS (1895) un théorème sur les systèmes articulés (cf. *C. R. hebdom. des séances de l'Acad. des Sc.*, Paris; t. 120, 1895 (1), pp. 981-3), qui permet de montrer qu'on peut d'une infinité de manières, tout expliquer par des liaisons à la manière de HERTZ, ou encore par des forces centrales.

(2) Nous citons d'après la grande édition ADAM-TANNERY des *Œuvres de Descartes* (12 vol. + un supplém.; Paris, 1897-1913). Les chiffres romains indiquent le volume, les chiffres arabes, la page.

duo horologia fieri possunt, quae, quamvis horas aequè bene indicent, & extrinsecus omnino similia sint, intus tamen ex valde dissimili rotularum compage constant : ita non dubium est, quin summus rerum opifex omnia illa, quae videmus, pluribus diversis modis potuerit efficere. Quod equidem verum esse libentissimè concedo, satisque à me praestitum esse putabo, si tantùm ea quae scripsi talia sint, ut omnibus naturae phaenomenio accuratè respondeant " (VIII, 327).

La nécessité, soulignée dans l'édition ADAM-TANNERY (3), de ne jamais séparer l'original latin (1644) de la version française des *Principes de la Philosophie* (1647), nous fait un devoir de reproduire ci-dessous la " traduction " du texte qu'on vient de lire, traduction dont DESCARTES a d'ailleurs assumé la responsabilité; les mots en italique indiquent des modifications par rapport au texte latin, les points indiquent une suppression.

" *On repliquera encore à cecy que*, bien que *j'aye peut-estre imaginé* des causes qui pourroient produire des *effets semblables à ceux que nous voyons*, nous ne deuons pas pour cela conclure que ceux que nous voyons sont produits par elles. Pource que, comme un horologier *industrieux* peut faire deux montres qui marquent les heures en mesme façon, & entre lesquelles il n'y ait aucune difference en ce qui paroist à l'exterieur, qui n'ayent toutefois... rien de semblable en la composition de leurs roües : ainsi il est certain que *Dieu* a une infinité de diuers moyens, par chacun desquels *il peut auoir fait que* toutes les choses de ce monde *paroissent telles que maintenant elles paroissent, sans qu'il soit possible à l'esprit humain de connoistre lequel de tous ces moyens il a voulu employer à les faire*. Ce que je ne fais aucune difficulté d'accorder. Et je croyrai auoir assez fait, si *les causes* que j'ay expliquées sont *telles que tous les effets qu'elles peuuvent produire se trouuent* semblables à ceux que nous voyons dans le monde, *sans m'enquerir si c'est par elles ou par d'autres qu'ils sont produits* " (IX, 2e partie, 322).

Mais citons encore POINCARÉ :

" Entre toutes ces explications possibles, comment faire un choix pour lequel le secours de l'expérience nous fait défaut ? Un jour viendra peut-être où les physiciens se désintéresseront

(3) IX, 2e partie, pp. XIX-XX.

de ces questions, inaccessibles aux méthodes positives et les abandonneront aux métaphysiciens. Ce jour n'est pas venu; l'homme ne se résigne pas si aisément à ignorer éternellement le fond des choses.

" Notre choix ne peut donc plus être guidé que par des considérations où la part de l'appréciation personnelle est très grande; il y a cependant des solutions que tout le monde rejettera à cause de leur bizarrerie et d'autres que tout le monde préfèrera à cause de leur simplicité " (4).

En écrivant, à propos de l'idéal scientifique de MAXWELL, ces lignes si profondes, POINCARÉ a-t-il pensé à justifier DESCARTES? Quoi qu'il en soit, ce passage s'applique admirablement, on en conviendra, à l'œuvre du savant dont on a fêté récemment le tricentenaire de la première publication.

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Le résultat acquis par DESCARTES, et qui constitue une application particulièrement saisissante du doute méthodique, appelle, si du moins l'on veut bien admettre notre interprétation des textes reproduits plus haut, quelques réflexions; celles-ci nous ont été suggérées par l'opportune et ingénieuse communication relative à la question des précurseurs, présentée par M. LÉON ROSENFELD au IV[e] Congrès international d'histoire des sciences (Prague, septembre 1937) (5).

DESCARTES fait figure de précurseur en annonçant un résultat qu'un autre physicien mathématicien devait retrouver, sous une forme plus restreinte et plus précise, quelque 250 ans plus tard; (ce résultat, notons-le en passant, ne répondait nullement à un besoin de la société). Il conviendra d'inscrire le nom de DESCARTES dans l'histoire des idées auxquelles se rattache ce théorème. Mais en dépit de l'autorité incontestée de l'auteur des *Principes*, cet énoncé est demeuré sans écho. Celui qui y est parvenu apparaît ainsi comme un pionnier isolé. Sommes-nous autorisés à dire que DESCARTES a enregistré un échec et est venu se heurter à une influence inhibitrice du milieu, qu'il s'agisse de la société

(4) H. POINCARÉ, *loc. cit.*, p. XV.

(5) On trouvera le texte de cette communication dans *Archeion*, vol. XX, n° 1, 1938.

en général ou, plus particulièrement, des sphères scientifiques ? Nous ne le pensons pas.

C'est que les découvertes scientifiques, en effet, ont un caractère d'inéluctable nécessité, que n'ont pas les œuvres artistiques et que l'histoire politique possède à un degré moindre encore. Dans notre leçon d'ouverture du cours d'histoire des sciences physiques et mathématiques, faite à l'Université libre de Bruxelles en 1931, nous disions : " On imagine trop que les manifestations supérieures de la pensée peuvent être abandonnées à des forces obscures ou au hasard et qu'en revanche il est possible d'introduire une discipline dans la conduite des hommes, dans les événements qui constituent l'histoire... L'histoire traditionnelle, qui peut prétendre tout au plus à recréer des atmosphères, est plus propre à nous divertir qu'à nous fournir des enseignements. On ne peut songer à établir systématiquement en histoire des liens nécessaires entre les choses, car les faits historiques sont trop souvent la conséquence de causes imprévisibles dont la nature se dérobe à l'étreinte de la raison : nous nous représentons l'avenir comme une image du présent projetée dans un espace vide, alors qu'il est le résultat de causes qui nous échappent pour la plupart. Il arrive souvent aux savants de se trouver avoir fondé bien des choses qu'ils ne prévoyaient guère ; la science est telle cependant, qu'il ne leur advient jamais d'avoir à protester contre des conséquences qui suscitent leur étonnement ; et c'est là une différence fondamentale entre les hommes de science et les hommes d'État, ceux-ci voyant maintes fois découler de leurs actes des faits en contradiction formelle avec leur volonté. Bien plus que les autres domaines où s'exerce l'activité de l'homme, la science a donc vraiment une histoire " (6). Rien ne ressemble moins au nez de CLÉOPÂTRE que la pomme de NEWTON (7) ; sans COPERNIC, nous aurions eu le système de COPERNIC ; mais sans BACH, aurions-nous les brandebourgeois ? Les mêmes idées reviennent aux savants de chaque génération ; d'où la naïveté de bien des accusations de plagiat ; le nombre d'esprits critiques et de penseurs indépendants et originaux est plus grand qu'on ne croit

(6) JEAN PELSENEER : « L'histoire de la science » (*Revue de l'Université de Bruxelles*, 37e année, 1931-1932, n° 2 ; pp. 140-141).

(7) Cf. notre note sur « La pomme de Newton » dans *Ciel et Terre*, LIIIe année, nos 6-7, juin-juillet 1937, pp. 190-193.

communément. Ces idées dont s'avise le savant, apparaissent ou disparaissent, en vertu du déterminisme qui commande le progrès scientifique, et l'on demeure stupéfait du nombre important de conceptions qui, émises à une époque déterminée, ne prendront, pour des raisons toutes nouvelles, leur pleine signification qu'au terme d'une échéance plus ou moins lointaine. Si l'histoire des sciences se prête à une interprétation plus profonde que ne font les autres branches de l'histoire, c'est parce qu'on y découvre le plus aisément un ordre dans la suite des événements.

DESCARTES est le précurseur de POINCARÉ; mais c'est toujours en vain que l'on est précurseur : la lecture de DESCARTES n'aurait rien appris à POINCARÉ. L'histoire découvre maints précurseurs à ceux qui ont été tenus pour des initiateurs; ceux-ci n'en sont pas diminués. L'éclat nouveau dont peut se parer, croyons-nous, la gloire de DESCARTES, n'entache en rien celle de POINCARÉ.

Bruxelles. JEAN PELSENEER.

Sir Samuel Garth
A Court Physician of the 18th Century

One of the recurring embarrassments of a career in literary criticism is the discovery of creative writers among men and women not officially engaged in the writing trade at all. Some of us who happen to be professionally interested in writing are often annoyed, slightly, to find those whom we think of as outsiders turning out fiction and poetry that we ourselves should like to have done, and might have, if we hadn't become teachers and critics. It begins to look as though the way to become a writer is to study medicine or law or mathematics or chemistry, or anything but literature. The ablest and most persistent of the encroachers upon 'our' domain have always been the medical men, and Doctors MAUGHAM, BRETT YOUNG, and A. J. CRONIN are merely carrying on a tradition long established in English literary history. I should like to introduce here a physician who helped to strengthen that tradition, in the early years of the eighteenth century. He was one of the best doctors of his time, and a famous wit and poet. His name is almost forgotten now, but his personality comes alive again in some old letters and other documents. He made no important scientific discoveries, but he healed many people and entertained many more. By both his science and his art, he won fortune and a high place in the society of his time. The medical profession has reason to be proud of the genial, talented general practitioner, Dr. SAMUEL GARTH.

Biographers of SAMUEL GARTH from JOHNSON (1) and THEOPHILUS CIBBER (2) to NORMAN MOORE (3) have associated the

(1) SAMUEL JOHNSON, *Lives of the Poets*, (London, 1781), ii, 313.

(2) THEOPHILUS CIBBER, *Lives of the Poets*, (London, 1753), iii, 263. An anonymous life of GARTH in No. 4225 (Ayscough's Catalogue) of the Additions to the MSS. in the British Museum also states that GARTH was descended of "a good family in Yorkshire." By internal evidence, this biography dates between 1737 and 1760.

(3) *D. N. B.*, vol. 21 (1890), pp. 31-32.

poet of the once renowned satire, "The Dispensary," with Yorkshire. Dr. MOORE sums up a century and a half of error by making the confident and somewhat clairvoyant assertion that GARTH was the eldest son of WILLIAM GARTH "of Bowland Forest in the West Riding of Yorkshire" and that he went to school at Ingleton "at the foot of Ingleborough." More recent studies by SCHENK (4), LEICHT (5), and HARVEY CUSHING (6) repeat these mistakes. No one, apparently, has taken the trouble to check the Yorkshire records, or even to find other GARTHS in Yorkshire. The latter task is difficult enough. In all the Yorkshire documents that I have searched, I have found only three GARTHS, all later than SAMUEL, and all in the North Riding (7). The plain fact is that the GARTH name is virtually unknown in Yorkshire.

The most reliable source for SAMUEL GARTH's place of birth is J. A. VENN's *Alumni Cantabrigienses* (8), which quotes the Peterhouse Register. SAMUEL GARTH was admitted as a pensioner at Peterhouse, Cambridge, on May 27, 1676, at the age of 16. The record states that he was the eldest son of WILLIAM GARTH of Bolam, Durham, and had attended school at Ingleton, Durham. Ingleton, in the parish of Staindrop, is about a quarter-mile south of Bolam, which is in Gainford parish.

Unfortunately, the Gainford registers (9), although they record the baptisms of sixty-six GARTHS between the years 1560 and 1784, make no mention of SAMUEL. But one of the sixty-six is THOMAS, son of WILLIAM GARTH of Bolam, baptized September 29, 1664.

For an explanation of this lack of records on SAMUEL's birth I am indebted to Colonel JOHN PARKER, C. B., F. S. A., of

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(4) T. SCHENK, "Sir SAMUEL GARTH und seine Stellung zum komischen Epos," *Anglistische Forschungen*, III, Heidelberg, 1900.

(5) W. J. LEICHT, "Garth's 'Dispensary'," Kritische Ausgabe, (in *Englische Textbibliothek*, 10), Heidelberg, 1905.

(6) HARVEY CUSHING, M. D., "Dr. GARTH, The Kit-Cat Poet, 1661-1718," (Reprinted from *Johns Jopkins Hospital Bulletin*, January 1906), Baltimore, 1906.

(7) *Victoria County History, Yorkshire*, North Riding, I, 245, 308.

(8) J. A. VENN, *Alumni Cantabrigienses*, Part I, vol. 2. WILLIAM MUNK, in his edition of the *Roll of the Royal College of Physicians* (2 vols., London, 1861), vol. 1, p. 456, corroborates VENN.

(9) Published, London, 1889.

Browsholme Hall, Clitheroe, to whom I was introduced by the Reverend W. R. JORDAN of Slaidburn, one of several Yorkshire rectors with whom I corresponded.

Colonel PARKER, who is an authority on genealogies, believes that there can be no doubt concerning SAMUEL GARTH's Durham origin. He writes (10),

> " The fact that there is no entry of the baptism of SAMUEL proves nothing. Being the eldest son, he might well have been baptized at his mother's home."

Colonel PARKER notes that SAMUEL's matriculation as a pensioner at Peterhouse implies that his father was a man of some position. He adds that there were GARTHS in good position in Durham in the 16th century.

There is considerable collateral evidence that GARTH is a Durham name. The *Durham Protestations* (11), (1641-1642) for St. Hellen Auckland, Gainford, and Heighington contain numerous GARTHS. *Durham Visitations* (12) trace the genealogical tree of the GARTHS of Headlam, Durham. The Ordnance Survey Map for Durham shows a " Hall Garth " on the ancient Roman road. The name is, of course, of Scandanavian origin.

SAMUEL GARTH took his B. A. degree at Peterhouse in 1679-80, his M. A. in 1684, and his M. D. in 1691 (13). We know little about his college career beyond the fact that his residence at Cambridge was not continuous in the period between his master's and his doctor's degree. The *State Papers* for January 24, 1698, include a " Warrant for a license to SAMUEL GARTH, doctor of physick, who went into the French King's dominions, since 11th December 1688, without license, and since returned without license, to stay in England or other the King's dominions (14)."

We are naturally curious to know why GARTH took this trip to the continent at precisely the time that JAMES II was asked to leave, because of his stubborn Catholicism, and the Protestant rulers of the Netherlands, WILLIAM and MARY, were invited to the throne of England. The implication is strong that GARTH

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(10) In a letter to this writer, December 14, 1935.
(11) *Surtees Society*, vol. 135 (1922), pp. 58, 65, 86, 95.
(12) J. FOSTER, *Durham Visitation Pedigrees*, London, 1887.
(13) VENN, *loc. cit.*
(14) *State Papers*, 44, 351, p. 1.

was a Catholic. ALEXANDER POPE always contended that GARTH was, although there is abundant evidence to the contrary. A more confusing implication, however, is that suggested by the records of the House of Lords, which report, under the date February 9, 1702-3, the passports to France of a group of persons who had licenses to come out of France " since March 8, last." Under February 15, there is annexed a " list of persons who had licenses in the reign of WILLIAM III to return into England, upon the Act of December 1697 to prevent correspondence with the late King JAMES, the warrants being countersigned by the late Mr. Secretary VERNON (15) ". Dr. SAMUEL GARTH heads the list, his warrant dated, as before, January 24, 1697-8, and a note repeats the testimony on his trip to France in December, 1688.

Strange as it may seem in the light of this evidence, GARTH was a rabid Whig throughout his political career, and a tremendous admirer of King WILLIAM, whom he glorified as " Nassau " in " The Dispensary " of 1699. It is hardly conceivable that he had any sympathy for JAMES, or for the Pretender. But it is entirely possible that he went abroad to study medicine; at any rate, one piece of legend about him is that he studied at Leyden for a time.

Whatever GARTH's reason for his continental visit, he was back in England to take his degree at Cambridge in 1691, and he became a candidate for the Royal College of Physicians, June 25, 1692 (16). A year later, June 26, 1693, " Dr. SAMUEL GARTH was proposed, balloted, and admitted a Fellow (17)." His election had apparently been for some time assured. We have two notes on the esteem in which he was held. On December 28, 1692, at a meeting of the College of Physicians, a letter from the Lords of the Admiralty was read, requesting the College to name " 3 or 4 physicians that they (the Lords) may choose one to take care of the sick & hurt men at Portsmouth." The College decided to recommend only one. After a ballot, Dr. SAMUEL GARTH was chosen and recommended (18). On December 30, the College wrote to the Lords of the Admiralty

(15) *Hist. MSS. Com.*, MSS. of the House of Lords, new series, vol. 5, p. 203.
(16) MUNK, *loc. cit.*
(17) *Hist. MSS. Com.*, 8th report (College of Physicians) 231*a*.
(18) *Ibid.*

recommending Dr. GARTH, " he being a Doctor of Physick of Cambridge and a candidate of the College, of good learning, having spent some years in foreign hospitals (19)." The Lords were not satisfied, but asked that three persons be nominated.

This notice is only the first of many tributes to GARTH's exceptional ability as a physician. Certainly it clarifies the cause of GARTH's trip to the continent, although we should still like to know why he left without license.

The records of the College of Physicians further note that on March 1, 1694 Dr. GARTH made a lecture " De Respiratione "; it lasted three days, and he concluded with a Latin speech. On March 8, the president and censors desired Dr. GARTH to print his lectures, which he promised to do in Latin (20). These Gulstonian lectures mark the beginning of GARTH's lecturing and orating career, and constitute the first insight we have into the slightly pretentious and prideful, yet competent Dr. SAMUEL GARTH.

On January 26, 1697, Dr. GARTH was appointed orator (21) of the College of Physicians, and delivered the Harveian Oration (22).

But it was the death of JOHN DRYDEN on April 30, 1700, which gave Dr. GARTH an opportunity to display his oratorical skill, and that humanitarianism which is the most appealing quality in his character.

On May 8, 1700, the proposal was made for the decent burial of DRYDEN from the College of Physicians, and was unanimously granted by the president and censors. The funeral was to be held under the auspices of the Kit-Cat Club.

We have two reports upon the oration which Dr. GARTH made upon this occasion. One occurs in a letter (23) from EDWARD HINTON, at Westminster, to his cousin, the Reverend JOHN COOPER, at Chester, and states that DRYDEN was buried by the Bishop of Rochester at the Abbey on Monday; that the Kit-Cat

(19) *Ibid.*
(20) *Ibid.*
(21) *Ibid.*
(22) A copy may be found in the Surgeon General's Library in Washington, D. C.
(23) *Hist. MSS. Com.*, 5th report (R. CHOLMONDELEY papers), 360.

Club were at the charge of his funeral, which was not great; and that Mr. MONTAGUE had engaged to build him a fine monument. " Dr. GARTH made a Latin speech, and threw away some words and a great deal of false Latin in praise of the poet."

The other criticism is offered by THOMAS HEARNE (24):

" ... an oration was pronounced by the famous Dr. GARTH, in which he did not mention one word of Jesus Christ, but made an oration as an apostrophe to the great god Apollo,—and, as a conclusion, instead of a psalm of DAVID, repeated the 30th ode of the third book of HORACE's odes beginning ' Exegi monumentum etc.' He made a great many blunders in pronunciation."

DRYDEN died just a year after the appearance, in the spring (25) of 1699, of Dr. GARTH's *magnum opus*, " The Dispensary," a mock heroic, bitterly satirical attack upon the gouging apothecaries of London and the physicians in league with them. At that time the Dispensarian quarrel was some twelve years old. In 1687, on July 28, an edict was passed by the College of Physicians calling upon all fellows, candidates, and licentiates to give advice *gratis* to the neighboring poor. The apothecaries promptly raised prices, and the poor were forced to throw away their free prescriptions. On August 13, 1688, the College decided to adapt its own laboratories for the preparing of medicines. This action brought about a split within the college itself into Dispensarians and Anti-Dispensarians. GARTH, just up from Cambridge in '91, joined the dispensarians. On December 22, 1696 (26), the latter group subsidized, by a £ 10 levy on each member, a clinical dispensary under the direction of Dr. THOMAS BURWELL. In 1697, THOMAS BROWN first attacked the Anti-Dispensarians in his pamphlet, " Physick lies a-bleeding, or the Apothecary turned Doctor" (27), and in the same year Dr. GARTH sharply rebuked the Anti's in the Harveian oration. But their excoriation came in 1699, in GARTH's long heroic couplet poem, " The Dispensary," in six cantos. Three editions of the work appeared

(24) *Reliquiae Hernianae*, (ed. BLISS, 1726), vol. ii, p. 267.

(25) MS. 21 *Codices Thomae Tanneri* (Bodleian Library), f. 63, WILLIAM ADAMS (of Christ Church?) to T. TANNER, Oxford, May 21, 1699: mentions appearance of " The Dispensary."

(26) An excellent summary of the Dispensarian quarrel is that by HARVEY CUSHING, in the Johns Hopkins article I have cited (Note 6).

(27) THOMAS BROWN, *Physick lies a-bleeding*, London, 1697.

in 1699 and a fourth in 1700. The poem established GARTH as a poet and a wit, according to the standards of his time, and doubtless gained him admittance to that select group of Whig politicians and litterateurs, the Kit-Cat Club.

Incidentally, one of the poet DRYDEN's last writings, his epistle, " To my honour'd kinsman JOHN DRIDEN, of Chesterton," contains a defense of GARTH and the Dispensarians (28).

We have no record of GARTH's first introduction to the Kit-Cats, but 1703 finds him composing verses to ladies CARLYLE, ESSEX, HYDE, and WHARTON, to be cut into the toasting glasses of the Club. His position as a wit, a Whig, and a versifier is from this time on assured. The roll of the Kit-Cat club reads like an abridged Debrett, combined with a list of best-selling authors. The dukes and earls include SOMERSET, DEVONSHIRE, NEWCASTLE, DORSET, ESSEX, and the great MARLBOROUGH. The knights, according to the order of FABER's prints of GODFREY KNELLER's portraits, occur in this sequence: Sir ROBERT WALPOLE, Sir JOHN VANBRUGH, Sir SAMUEL GARTH M. D., Sir RICHARD STEELE. The esquires include JOSEPH ADDISON and WILLIAM CONGREVE. The last member, the only " Mr.," is shrewd old JACOB TONSON, of the publishing trade.

But mention of KNELLER's portrait of Sir SAMUEL is an anticipation. GARTH's knighthood was the reward of long and loyal service, to the Whigs and to medicine.

The manuscript records on Dr. GARTH from 1700 to his death in 1719 trace his activities along two constantly converging lines, his professional and his political career, culminating not in his being knighted in 1714 but in his being appointed the following year physician-in-ordinary to King GEORGE I, and physician-general to the army.

That GARTH was continuously and enthusiastically engaged in the practice of medicine is amply proved not only by external documentary evidence (29) but by his own letters. A group of these, unfortunately not dated but probably early, are twelve addressed to Sir HANS SLOANE, famous physician and founder of the British Museum. Nine of the letters are requests for

(28) Published by TONSON, London, 1700. Verses 96-116 concern GARTH and the Dispensarians.

(29) *Hist. MSS. Com.*, 15th report, part iv, 256; part v, 368. 9th report, 473*a*.

Dr. SLOANE's assistance in some routine medical duty, or in some piece of charity which GARTH was eager to accomplish. The first two letters in the collection in MS SLOANE 4059, ff. 28-49 strike a contrast that is typical of their writer:

" Dear Sir,
If you can recommend this miserable slut to be flux'd you'll do an action of charity. I am, Sir, Your most obedient servant,
S. GARTH."

" Dear Sir HANS,
If you can gett this poor maid into Christ Church Hospitall you'll much oblige Your obedient servant,
S. GARTH."

Possibly more characteristic still, when we recall THOMAS HEARNE's comment on the paganism of GARTH's funeral oration on DRYDEN, is a note in the Earl of EGMONT papers (30), under the curious heading " Nel Gwyn "; " Dr. GARTH comforted a dying courtezan in despair by telling her on his honor there was neither God nor future state."

We are reminded of POPE's lines in his " Farewell to London," 1718:

Farewell Arbuthnot's raillery
On every learned sot;
And Garth, the best good Christian he,
Although he knows it not.

It is sufficiently clear from his correspondence, and from documentary evidence besides, that GARTH performed many an act of charity, and helped on to preferment many a struggling aspirant to literary or political honors.

Scattered notices (31) on GARTH's career in the first decade of the new century indicate that his own advancement was not rapid but that his wit and good humor, and acknowledged professional skill, won him first the patronage and then the friendship of certain powerful Whig lords. So far as his rise in his profession is concerned, in 1702 he became a censor of the College of Physicians and in 1706 a Fellow of the Royal

(30) *Hist. MSS. Com.*, 7th report, 244*b*.
(31) *Hist. MSS. Com.*, MSS. of the Marquis of BATH, vol. iii, 415. 7th report, 434*a*, 507*a*.

Society. In this same period appeared the fifth and sixth editions of "The Dispensary," in 1703 and 1706, and a poem in 1709 consoling the Earl of GODOLPHIN, the great Whig minister, upon his loss of office (32).

Evidence for GARTH's association with great men occurs in increasing bulk after 1710, when the Whigs, the war party supporting MARLBOROUGH, were reeling under the terrific assaults of JONATHAN SWIFT. GARTH's position is not altogether an admirable one; he appears as a political go-between and something of a gossip. On September 6, 1710, Dr. WILLIAM STRATFORD of Christ Church writes (33) to EDWARD, later Lord HARLEY, Tory Minister-to-be and SWIFT's friend:

"It is said a commission was ordered to make Duke Hamilton Governor of Edinburgh Castle, that upon this news the Duke of Argyll had written a very angry letter—it is not said to whom—threatening the utmost revenge, if that place were so disposed of. That at the same time he had sent a copy of his letter to several friends, desiring them to publish it in all coffee houses, that amongst others a copy was sent to Dr. Garth, who had gone round all the coffee houses to read it."

In July 1711, HENRY WATKINS writes (34) to JOHN DRUMMOND from the continent:

"I told you in my last Dr. Garth was arrived here, and now tell you he intends to go away tomorrow. I cannot find he has been very lavish with his tongue but dare venture to assure you, my Lord Duke has trusted him with nothing but what may be safely proclaimed at Charing Cross. I dined with his Grace the day after the doctor's arrival, and he told us very merrily of the letters the doctor brought him from Lady Duchess, Lord Godolphin and Mr. Craggs. He said that by the colour and smell of them it would seem as if the doctor had made use of no other paper on any occasion during the whole voyage. You may believe he will have answers to the letters he brought, but they will be such as need not be whispered, and if he had anything to tell, you will not have your share of it, for he intends to go home by Ostend."

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(32) In connection with this occasional poem by GARTH, there is a letter among the Clements MSS. reported by the Historical Manuscripts Commission, vol. 55, part viii, page 251, from an ARABELLE PULTENEY (?) to a Mr. JOHN (?) MOLESWORTH, dated about 1710, which ends with a reference to the elopement of Dr. GARTH's daughter with Colonel BOYLE, brother of HENRY BOYLE, speaker of the House of Commons in Ireland. The letter closes with a copy of satirical verses entitled, "The E(ar)l of G(o)d(olphi)n to Dr. G(ar)th upon the loss of Miss Dingle in return to the Doctor's consolatory verses to him upon the loss of his Rod."

(33) *Hist. MSS. Com.*, vol. 29, part vii, p. 17.

(34) *Hist. MSS. Com.*, vol. 29, part v, p. 56.

And at precisely the same time, General HANS HAMILTON informs (35) the Earl of OXFORD:

"Dr. Garth made a short visit here of three days; the morning after his arrival he was locked up about two hours with 73 (Marlborough) when no one else had admittance; he would willingly have stayed to see tomorrow's march, but was hastened away, and for more expedition goes to Ostend."

In 1712 numerous letters (36) pass between GARTH and the Duchess of MARLBOROUGH. Finally, on January 27, 1712-13, RALPH PALMER writes (37) to Viscount FERMANAGH:

"They talk of a very speedy instalment of the gartered knights at Windsor The Duchess of Marlborough, I hear to night, is gone, having presented many jewels to her friends & acquaintances, and Dr. Garth—a diamond ring of £ 200 value. 'Tis exit instead of obiit."

The occasion for the Duchess of MARLBOROUGH's gift was the fall of the Whig ministry and the banishment of the CHURCHILLS. SWIFT and the Tories had accomplished the defeat of the great Duke.

On May 7, 1713, GEORGE BERKELEY writes (38) from London to Sir J. P.:

"The very day peace was proclaimed, instead of associating with the Tories, I dined with several of the other party at Dr. Garth's where we drank the Duke of Marlborough's health, though they had not the heart to speak one word against the peace. Indeed the spirit of the Whigs seems quite broken."

With the death of Queen ANNE, and the return of the Whigs to power upon the accession of GEORGE I, GARTH finally won his reward. He was knighted on October 10, 1714 and, by his own request, with the Duke of MARLBOROUGH's sword. In 1715

(35) *Ibid.*, p. 54.

(36) *Hist. MSS. Com.*, 8th report, 54*a*.

(37) *Hist. MSS. Com.*, 7th report, 508*a*.

(38) *Ibid.*, 239*a*. STUART J. REID, in his biography, *John and Sarah, Duke and Duchess of Marlborough*, (New York, 1914) stresses the exceptional degree of GARTH's esteem and affection for the CHURCHILLS. He quotes from two of GARTH's letters, to be found among the *Blenheim Papers*, passages which testify both to the grace of the doctor's courtiership and the depth of his loyalty. The *Blenheim Papers* are now in the vigilant custody of WINSTON CHURCHILL, who is writing the last volumes of his authoritative lire of the famous Duke. We do have, however, GARTH's own poem on the banishment of MARLBOROUGH. It is a stringing rebuke to an ungrateful, fickle England.

he was appointed physician-in-ordinary to the king, and physician-general to the army (39).

1715-1716 was an eventful year in the life of Sir SAMUEL GARTH, as it was in the history of England. It was the year of the Jacobite rising in Scotland, and GARTH, along with Sir RICHARD STEELE, seems to have had a hand in keeping the northern counties quiet, and loyal to the king. At any rate, that is the implication in the first of six extant letters (40) from GARTH to the Duke of NEWCASTLE, whose Duchess was the grand-daughter of MARLBOROUGH (41). All of the letters to NEWCASTLE, who was Earl of CLARE and for whom GARTH wrote what is in my opinion his best poem, " Claremont " (1715), are full of Sir SAMUEL's wit and charitableness, the two traits which abide in his character to the very end. Two of the letters, the third and the sixth of the sequence in the manuscript collection, are pleas for aid for two impoverished poets, a Mr. CONDITT and a Mr. WELLSTEAD.

One of the contemporary tributes to Sir SAMUEL GARTH's power and influence both as a poet and as a defender of the

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(39) This honor called forth an amusing poetical petition from one of GARTH's friends, Dr. VERNON, rector of Redmill in Leicestershire. MS. *Stowe*, 155, ff. 98*b*-100*a*, is a heroic couplet poem, " To Sir SAMUEL GARTH, Upon his being made Physician to the King."

It begins,

" Thou British Prince of soft harmonious lays
For shining merit crownd by willing bays
Whom Phoebus dos with double art inspire
To mingle potent herbs and tune the lyre."

And then goes on to make the humorous plea,

" O ! then relieve whom shuffling chance has thrown
From what he lik'd, the learned and the Town
And forced to preach neglected and obscure
To snoring Bumpkins in a Country Cure,
Fixt in disgrace to arts for slender pay
And tith of addle eggs to starve and pray."

The whole poem is as good a performance in the heroic couplet as anything GARTH himself ever wrote.

(40) No. 32685, *Additions to the MSS. in the British Museum*, f. 2-f. 10.

(41) The fifth of the Newcastle letters contains a fair illustration of GARTH's courtier's wit. " I hope the Dutchess of Newcastle is quite well. It is strange she shou'd be so ill treated by the ayr of the Sea from whence she rose. A Poet thinks it no more reasonable for the daughter of Jupiter to be a Goddess than is the Gran-daughter of Mars."

Brunswick succession is an anonymous poem (42), printed for BERNARD LINTOTT in London in 1716 : " An Epistle to Sir SAMUEL GARTH occasion'd by the Landing of the Pretender and the Report of His Royal Highness the Prince of Wales's Going to Scotland." The poem is prefaced by an elaborate dedication to GARTH, and begins with an appeal to him to defend the King and Prince in his celebrated verse. The closing lines are these :

> " Congreve for this the Lyre neglected strings
> In Addison a second Virgil sings.
> Nor wilt thou, Garth, unmindful of the Day,
> Refuse to Britain's Hopes a Solemn Lay :
> Not Unrewarded will descend the Song,
> That must, with Theirs, the Poet's Fame prolong.
> To Bless, like them is First; the Next Degree
> Of Mortal Glory is To Praise like Thee."

Four letters (43) among the *Stuart Papers*, written in the fall of 1716, mention Dr. GARTH's, ADDISON's, and others' negotiations in Paris with BOLINGBROKE, the Tory minister of the last years of Queen ANNE's reign. Three of the letters are addressed to the Duke of MAR, leader of the Jacobites, and express concern over the possibility of BOLINGBROKE's being won over by the Whigs.

Several News Letters (44) toward the end of 1717 report DR. GARTH's activities both as a court-physician and a wit. These are capped by a letter (45), dated June 20, 1718, from Sir THOMAS HIGGINS to the Duke of MAR, from St. Germain :

> " Very few of our countrymen are at Paris at present. Dr. Garth is there, whom my brother saw. He speaks with respect of his master George, but says the Prince, his son, is such a scoundrel that he is despised by everybody and has very few partisans, and that he will never be able to hold the reins; if he should ever come to govern."

This is the Prince whose valor against the Pretender's threat Sir SAMUEL was called upon to celebrate, in the foregoing " Epistle " of 1716.

Politics aside, GARTH was admired and respected by the writers

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(42) No. 33954, *Additions to the MSS. in the British Museum*, f. 69-f. 74.
(43) *Hist. MSS. Com.*, vol. 56, part ii, 422, 469, 488; part iii, 24.
(44) *Hist. MSS. Com.*, vol. 29, part v, 538, 542, 546.
(45) *Hist. MSS. Com.*, vol. 56, part vi, 556.

of his time, and won the distinction of being praised not only by his fellow Kit-Cats, ADDISON (46) and STEELE (47), but by two members of the Tory Scriblerus Club, GAY (48) and POPE (49).

Less authentic reflections and reminiscences upon GARTH's character may be found in *Spence's Anecdotes* (50). Two versions of his death occur there, one of which is credited to POPE and asserts GARTH died a Papist. The other, contributed by a Mr. TOWNLEY of Townley, Lancashire, says that the good doctor attempted suicide through blood-letting. Mr. TOWNLEY concludes: " He was the most agreeable companion I ever knew." Both POPE and TONSON are reported as saying: " GARTH, VANBRUGH, and CONGREVE were the three most honest-hearted, real good men of the poetical members of the Kit-Cat Club."

The notice in *Musgrave's Obituary* gives the date of the poet's death, the 18th of January, 1719. He was buried in St. Mary's of Harrow-on-the-Hill, beside Lady GARTH, who had died May 1, 1717.

The " hail and farewell " to GARTH's career occurs on folio 198 of MS *Stowe* 246 in the British Museum, wherein LANCELOT BURTON, on January 26, 1718-19, writes to recommend Dr. ALEXANDER SANDILANDS for the post of physician-general to the army, vacant by the death of Sir SAMUEL GARTH.

THEOPHILUS CIBBER closes his mid-eighteenth century life of GARTH with this statement (51):

" His estates in Warwickshire, Oxfordshire, and Buckinghamshire are now possessed by his grandson, HENRY BOYLE, Esq;

(46) *The Whig Examiner*, Number 1, Thursday, September 14, 1710.

(47) STEELE dedicated *The Lover* to Sir SAMUEL GARTH, calling him " a man of wit, and a great poet."

(48) JOHN GAY, *Poems*, 1714: " To BERNARD LINTOT ":

" Whenever Garth shall raise his sprightly song
Sense flows in easy numbers from his tongue;
Great Phoebus in his learned son we see,
Alike in physic as in poetry."

(49) POPE mentions GARTH with respect and admiration in his *Dunciad*, *Epistle to Dr. Arbuthnot*, and *Essay on Criticism*, as well as in the *Farewell to London*, already quoted.

(50) JOSEPH SPENCE, *Observations, Anecdotes, and Characters of Books and Men*, London, 1820. (In *Camelot Series*, vol. 20, ed. JOHN UNDERHILL.)

(51) CIBBER, *op. cit.*, iii, 272.

whose amiable qualities endear him to all who have the happiness of his acquaintance."

The Dispensary poet and court-physician had prospered. And evidently his wit and good nature died not altogether.

The last record of GARTH in the manuscripts is a letter (52) of ALEXANDER POPE's to JACOB TONSON in 1735, asking the publisher for a copy of the poetry of his old friend, Dr. GARTH. That is a considerable tribute of remembrance, coming from the greatest poet and dyspeptic of his time.

Northwestern University, Evanston, Ill. WILLIAM H. CORNOG.
September, 1937.

(52) *Hist. MSS. Com.*, 2nd report, 71.

The first table of the normal probability integral : Its use by Kramp, who constructed it

The name of CHRÉTIEN KRAMP is not found among those of the great mathematicians, but his few contributions to pure and applied mathematics, though not strikingly original, are of considerable importance and give positive evidence of great mathematical ability. Perhaps the number of varied pursuits in which he was engaged prevented him from becoming an outstanding leader in any one of them. During the first part of his life KRAMP practiced medicine in Strasbourg, the city in which he was born (1760), in Paris, and in various towns of Germany. Shortly before 1800, he became Professor of Physics and Chemistry at the Central School of the Department of Roer, a post that he held until 1808. About 1810, he was named Professor of Mathematics and Dean of the Faculty of Sciences at Strasbourg, holding the latter title until his death in 1826. His published works, some fifty or more in number, treated such diverse subjects as medicine, life assurance, physics, astronomy, and almost every principal branch of mathematics. Many of his earlier works were in German, the others mostly in French (1).

The first published table of the normal probability integral appeared in one of KRAMP's works dealing with the refraction of light—*Analyse des réfractions, astronomiques et terrestres*, Strasbourg, 1799 (see facsimile of title page). This fact is generally known, especially to workers in mathematical statistics, but the exact manner in which this integral could have been used in a theory of refraction must have evoked the curiosity of many people.

(1) For this fragmentary biography of KRAMP I am indebted to the book *Géomètres Français sous la Révolution*, by NIELS NIELSEN (Copenhague, 1929; *Isis* 16, 502) kindly sent to me by Dr. SARTON.

Writers on the history of mathematics and mathematical statistics have either given no clue at all concerning the use made by KRAMP of this table, or else have forgivably implied that it may have been used for computing probabilities associated with the astronomical observations—a somewhat natural inference. GRACE O. SAVAGE, Librarian at the United States Naval Observatory, was kind enough to place at my disposal a copy of the rare old book in which this table appears, in order that I might examine it at leisure and obtain a definite answer to this question. The notes that follow provide such an answer.

In his theory of astronomical refraction, KRAMP developed two fundamental differential equations :

$$(1)\quad d\phi = -\frac{dv}{\sqrt{1 - vv - 2\omega + 2\omega Y}}$$

$$(2)\quad d\mathrm{R} = -\frac{\omega v\, dv}{\sqrt{1 - vv - 2\omega + 2\omega Y}}$$

The meanings of the symbols in these expressions are of no general interest except that $Y = e^{\frac{v - \sin A}{k}}$ and ω, k, and A are constants determined by local meteorological conditions and from the astronomical observations themselves.

The integral of (1) taken from $v = \sin A$ to $v = 0$ gives ϕ, an angle in terms of which the astronomical refraction may be calculated. According to KRAMP the expression for the differential $d\phi$ is identical (except for a difference in choice of symbols) with one arrived at by EULER in 1754. Quoting from KRAMP, page 162, we have " There remains the problem of integrating this differential. Here all of the skill of the great geometrician [EULER] found itself to no avail, for he says : 'But in whatever manner one works with this equation, one cannot obtain from it an expression which gives the refraction for all possible elevations, although it would be easy to apply it to refractions that correspond to considerable elevations; but for very small elevations, these expressions always give results greatly in error. Thus everything hinges upon the discovery of a method that will lead us to the actual curvature of the trajectory of the light ray.' " Apparently, " these expressions " refers to certain approximations based on (1) which EULER had made.

Equation (2) is such an expression and the integral of dR taken between the same limits as those for equation (1) gives the total curvature of the trajectory, which is the astronomical refraction. Since KRAMP makes no mention of its having been

ANALYSE

DES

RÉFRACTIONS

ASTRONOMIQUES

ET

TERRESTRES

Par le citoyen KRAMP,

Professeur de Chymie et de Physique expérimentale à l'école centrale du Département de la Roer.

IMPRIMÉ A STRASBOURG
CHEZ PHILIPPE JACQUES DANNBACH,
L'AN DE LA RÉPUBLIQUE VII.

ET SE TROUVE A LEIPSIC
CHEZ E. B. SCHWIKKERT,
MDCCLXXXXVIIII.

previously given, it may be assumed that the expression for dR is original with him.

KRAMP's method of solving for R consists, first, in expanding (2) in a power series of $2\omega(1 - Y)$, the general term of which may be written

$$\frac{1.3.5 \ldots (2n-1)Y(1-Y)^n \omega^{n+1} v\, dv}{n!\, k (1-v^2)^{\frac{2n+1}{2}}}$$

and by virtue of the fact that $Y = e^{\frac{v - \sin A}{k}}$, the integration is thereby reduced to a series of integrals each of the form

$$\int_o^{\sin A} e^{\frac{mv}{k}} (1 - v^2)^{-\frac{2n+1}{2}} v \, dv$$

where m is some positive integer.

KRAMP's next step is to transform each of these integrals into the form

$$\int_a^{\beta} e^{f(x)/c} \, dx$$

where c is a " relatively small " number. His purpose in making this last transformation was to make use of the work of LAPLACE dealing explicitly with integrals of this form (Sur l'approximation des formules qui renferment des facteurs élevés à grandes puissances, inséré, parmi ceux de l'académie des sciences, année 1782). With certain conditions upon $f(x)$, $df(x)$, and the limits α and β, integrals of this form may be expressed as the sum of a series of integrals each of the form

$$e^{t^2} \int_{\gamma}^{\infty} t^{-2n} e^{-t^2} \, dt$$

and, of course, KRAMP's functions meet all these conditions.

The last step is a reduction formula expressing this type of integral as the sum of several integrals of the form E (x), where

$$E(x) = e^{x^2} \int_x^{\infty} e^{-x^2} \, dx$$

and the solution is completed with the aid of his tables (2) of $\Gamma_x(\frac{1}{2})$.

It is observed that there are many steps involved in the actual computations. In order to facilitate this work, KRAMP developed summation formulae and general expressions for the coefficients of the many computational series involved. His thoroughness is remarkable.

At the point where the construction and use of the table of

(2) KRAMP does not use $\Gamma_x(\frac{1}{2})$ to denote this integral. He does develop a function for which he uses the symbol Γ, but it is not our present day gamma function.

$\Gamma_x(\frac{1}{2})$ is explained (2), KRAMP remarks "Since the value of this integral is absolutely essential for the calculations of refractions which approach the horizon [corresponding to angles which gave EULER so much trouble]; since it is equally indispensible in the calculation of probabilities; since, indeed, the solution of such a multitude of differential equations depends upon this same integral, I believe that the time and trouble involved in calculating such a table is justified." KRAMP's own use of this table, however, was confined to the calculation of refractions, so far as this particular work of his is concerned.

Although KRAMP gave explicit expressions for calculating the values of any "moment" of the function e^{-x^2}, and actual values for the even moments ending with the 8th, he attached no particular interpretation to them; to him they merely represented intermediate steps in the transformation of his original integrals into forms which could be evaluated by means of his tables.

Aside from the parts of KRAMP's book that deal with the use of his table of what we now call the normal probability integral, other sections contain material of unusual interest. The theory of refraction as developed by KRAMP would hardly be of practical interest to astronomers of today, but the passages devoted to mathematical methods contain a wealth of material which could with profit be studied by modern students of pure mathematics. It is in this book that KRAMP introduces and develops his generalized factorial (3).

$$a^{m\mid n} = a(a+n)(a+2n)\ldots(a+mn-n)$$

Indeed, one is of the opinion, after reading the whole of the book, that a more fitting title would have been "The Theory

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(3) In this book, KRAMP used the word *facultés*, but in his *Éléments d'arithmétique universelle* (Cologne, 1808) occurs the remark "... I have given it the name *facultés*. Arbogast substituted for it the choicer and more French designation of *factorielle*." VANDERMONDE appears to have been the first (1772) to adopt an explicit symbol for the product

$$a(a-1)(a-2)\ldots(a-m+1)$$

denoting it by $[a]^m$, wheras KRAMP was the first (1799) to give such an expression an explicit name. KRAMP's expression, though categorically no more general than VANDERMONDE's, possesses a symbolic advantage in algebraic manipulations.

and Calculation of Factorials, With Applications to Problems of Refraction."

The translation of this book, and the review here appearing, were undertaken at the suggestion of Dr. HELEN WALKER and Dr. W. EDWARDS DEMING. The patient and helpful counsel of Dr. DEMING during the months that were devoted to this interesting task is gratefully acknowledged.

Washington, 8th October 1937. A. MASON DU PRÉ, JR.

The DIEZ portrait of NILS GABRIEL SEFSTRÖM, 1840. Reproduced by courtesy of the late Dr. H. G. SÖDERBAUM from his "Jac. Berzelius-Levnadsteckning".

Portrait medallion of N. G. SEFSTRÖM (1787-1845). The medallion was struck for the Swedish Academy of Sciences in 1861. Courtesy Prof. EDV. JOHAN NORDSTRÖM, Upsala.

Nils Gabriel Sefström
The sesquicentennial of his birth

Among BERZELIUS' students from near and far, one of the most famous was NILS GABRIEL SEFSTRÖM, a fellow countryman. SEFSTRÖM was born in Ilsbo parish, North Helsingland on June 2, 1787 (1), (2) and was educated at the Hudiksvall elementary school, the Hernösand gymnasium, and the University of Upsala. His father and a younger brother were both curates. To the disappointment of his father, SEFSTRÖM became much more interested in the physics and chemistry books at Hudiksvall than in the theological ones.

While serving in 1809 as private tutor in Stockholm, he often listened eagerly to BERZELIUS' lectures. In the spring of 1811 BERZELIUS wrote to PER LAGERHJELM (3), (4): SEFSTRÖM has moved into the laboratory, which has now under his care become the neatest room on this floor.... Experiments are in full sway." SEFSTRÖM soon succeeded M.M. AF PONTIN as BERZELIUS's adjunct. In 1812 SEFSTRÖM, PER LAGERHJELM, EMANUEL ROTHOFF, and J. H. AF FORSELLES prepared about two grams of metallic potassium by heating potash and iron filings in a gun-barrel according to the method devised four years previously by GAY-LUSSAC and THENARD. SEFSTRÖM also determined the atomic weight of mercury.

When BERZELIUS visited the continent in 1812, he chose SEFSTRÖM to give the lectures at the Royal Military Academy

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(1) HERM. HOFBERG, "Svenskt biografiskt handlexikon", ALBERT BONNIERS Förlag, Stockholm, **1876**, pp. 260-261.

(2) Anon., "Biografi öfver NILS GABRIEL SEFSTRÖM", *Kongl. Vet. Akad. Handl.*, **1845**, pp. 459-70; *Jern-Kontorets Annaler*, n. s., **1**, Suppl. 1-10 (1846); *Post- och Inrikes Tidningar*, **1846**, 219-20.

(3) H. G. SÖDERBAUM, "Jac. Berzelius-Levnadsteckning", ALMQVIST & WIKSELLS Boktryckeri A.-B., Upsala, **1929-31**, 3 vols.

(4) BERZELIUS to PER LAGERHJELM, May 17, 1811.

at Carlberg during his absence. In the following year SEFSTRÖM became an adjunct at the Caroline Institute of Medicine and Surgery and received his degree of Doctor of Medicine from the University of Upsala. For a number of years he served as house-physician at the Royal Serafim Hospital, carried on a private practice, and taught at Carlberg. A letter from BERZELIUS to J. G. GAHN in 1814 (3), (5) shows how SEFSTRÖM's responsibilities were increasing. After accepting GAHN's invitation to visit him, BERZELIUS added: "SEFSTRÖM cannot come, for he must tend to his work at Carlberg during the summer, and one of us must always be on hand for the Board of Health." The fourth volume of the *Afhandlingar i fysik, kemi, och mineralogi* in 1815 bore, among others, the names of BERZELIUS, SEFSTRÖM, GAHN, PONTIN, and WILHELM VON HISINGER as editors. On April 12th of that year SEFSTRÖM was elected to membership in the Swedish Academy of Sciences (3).

In the winter of 1816 BERZELIUS lectured only to PRINCE OSCAR, Duke of Södermanland, and his immediate retinue, and turned over the other students to SEFSTRÖM. In a letter to GAHN (3), (6) BERZELIUS wrote: "SEFSTRÖM's lectures have begun. The auditorium has never been filled to capacity, but those who do come have been especially attentive... For a first attempt, SEFSTRÖM has done excellently." The audience included many distinguished members of the Swedish aristocracy.

In 1818 SEFSTRÖM became a professor at the School of Artillery at Marieberg. While BERZELIUS, J. A. ARFWEDSON, and N. W. ALMROTH were touring the continent in 1818-19, he took over the master's teaching duties at the Caroline Institute and carried out research necessary for compiling the Swedish Pharmacopeia. In the meantime BERZELIUS had been appointed to a committee for organizing a school of mines in Fahlun, and had succeeded in having SEFSTRÖM chosen as its first instructor of chemistry. Through his experiments in the puddling process at the Skebo works Sefström had already demonstrated his interest and ability in mining and metallurgy.

During a sad visit to Fahlun soon after the death of J. G. GAHN,

(5) BERZELIUS to J. G. GAHN, June 13, 1814.
(6) BERZELIUS to GAHN, Dec. 23, 1816.

BERZELIUS wrote to Carl PALMSTEDT (3), (7) : "I confess that I sympathize with SEFSTRÖM's desire to come here in preference to Upsala... One enters into GAHN's possessions as though they were one's own and immediately sets to work; the filters lie ready-cut, the clean-washed glassware is on the shelf, and the charcoal near the sandbath..." BERZELIUS believed that SEFSTRÖM was much better fitted for the Fahlun position than for the one at Upsala. Fahlun had long been famous for its great copper mine, which had been worked since the thirteenth century, and in 1818 BERZELIUS had discovered the element selenium in the red slime from a sulfuric acid plant which obtained its sulfur from the pyrite of this mine.

From 1820 until his death in 1845 SEFSTRÖM edited the *Jern-Kontorets Annaler (Annals of the Iron Corporation)*, and in 1826 the *Bruks-Societeten (Manufacturing Association)* awarded him its large gold medal for his services to this journal.

His own contributions to it include papers on the following subjects : the composition of refinery slag and its action on fire-clays, analyses of clays used in the iron industry, the French decimal system of weights and measures, the condition of the iron industry in France, the importance of scientific research for the improvement of iron manufacture, and the carbonization of wood (1820); on the strenght and rigidity of building materials (excerpt from BARLOW and TREDGOLD), experiments relating to steel (excerpts from foreign papers), and a translation of TELFORD's research on the strenght of iron (1821); on the utilization of hammer scale, the construction and use of the slide-rule, smelting experiments in the slag-furnace at Österby, and "leaves from my notebook" (1822); questions regarding the effect of the blast on the blast-furnace process, some simple machines used at the Götha Canal, and the improvement of forging (1823); on Italian methods of carbonization (translation, 1824); analyses of slag from Skebo and a black powder obtained in the etching of iron (1825); analysis of a highly titaniferous iron ore, and the installation of lightning rods (translation, 1826); analysis of ash from the Johannisholm glassworks, LAGERHJELM's experiments on the properties of rolled and wrought iron, and improvements in the manufacture of

(7) BERZELIUS to CARL PALMSTEDT, Aug. 15 and 16, 1820.

Swedish iron (1827); a description of his forge, a furnace for roasting iron ores, roasting experiments at Finspong (sic) (1828); a comparison of different roasting processes, SCHEDIN's views on the blast-furnace process (1830); the larch tree (translation from BLAUEL), roasting furnace for bog ores (1831); analysis of the mine water at Fahlun (1832); bookkeeping in manufacturing plants (1833); elementary principles of water power, and warm air apparatus (1834); elementary course in bookkeeping (1835); STARBÄCK's method of calculating blast-furnace effects (1837); synopsis of the most important phenomena of geology, according to BUCKLAND (1840); a foreign journey (1842); description of a portable leveling-instrument with mirror, ancient methods of counting, the effect of warm air on iron (1843); the history of iron mining in Sweden (1844); OSMUND's iron, a contribution to the early history of iron manufacture (1845); and annual reports on the work at the Fahlun School of Mines.

In 1825 SEFSTRÖM entertained a party of Swedish scientists who stopped at Fahlun to study the manufacture of sulfur, sulfuric acid, and GLAUBER's salt, the mineral collections at the School of Mines, and the great copper mine. BERZELIUS remarked about the admirable condition of the school, "where orderliness reigns, which, with so many people working, is remarkable" (3), (8).

SEFSTRÖM made important contributions to the arts of smelting and forging, and invented a roasting-furnace and a very successful forge. In 1827 he and BERZELIUS were stopping at an inn at Finspång (3), (9). "SEFSTRÖM", said BERZELIUS, "had brought with him an eight-blast forge and set it up at Finspång. We had a chance to test this wonderful instrument, which gives the most intense ordeal by fire like a plaything. I had brought with me a little cobalt, which [J. F. P.] ENGELHARDT had reduced with hydrogen and which he now had a chance to melt, which was done excellently and without anything being added except a little soda... "

In September of the same year BERZELIUS and C. G. MOSANDER went to Västervik to attend the wedding of SEFSTRÖM and EMILIE NORDENSTRÖM (3), (10). The marriage was a happy one, but

(8) BERZELIUS to CARL PALMSTEDT, June 5 and 12, 1825.
(9) BERZELIUS to CARL PALMSTEDT, July, 1827.
(10) BERZELIUS to EILHARD MITSCHERLICH, Sept. 25, 1827.

their only child was not born until a month after SEFSTRÖM's death. She was named GABRIELA in his honor.

In 1801 Professor A. M. DEL RÍO of the School of Mines of Mexico had analyzed a brown lead ore from Zimapán and had found in it a new metal which he called *erythronium*. Subsequently, however, he made the incorrect conclusion that his "erythronium" was merely chromium. In the latter part of 1828 FRIEDRICH WÖHLER of Berlin analyzed a specimen of this ore, which DEL RÍO had presented to ALEXANDER VON HUMBOLDT. In speaking of this analysis, which had been interrupted by illness, WÖHLER wrote on January 18, 1829 : "God knows what this mineral contains, which so modifies the great quantity of chromium which it contains as? that I don't blame DEL RÍO for thinking he had found a new metal in it. What kind of a substance can it be that makes potassium chromate and its solution in water colorless? But immediately yellow with acids. It was most annoying to me to be interrupted in these experiments" (11).

In his report on the School of Mines for 1824 (12), SEFSTRÖM had mentioned a test for cold-shortness which RINMAN (*), the Superintendent of Mines, had devised. RINMAN had noticed that when cold-short iron was etched with hydrochloric acid, a loosely attached black powder was deposited on its surface. SEFSTRÖM analyzed this powder in 1824 and found it to consist of siliceous earth, iron oxide, and phosphoric acid. In the same year, LARS ZACHRISSON, one of his students, found titanium in the slag and ores from the Eckersholm blast furnace near Taberg, Småland, and SEFSTRÖM suggested that the well known softness of the Taberg iron might be due to its titanium content. In 1830 he noticed that, in spite of its softness, this iron reacted positively to RINMAN's test for cold-shortness. He therefore carefully investigated the black powder from the hydrochloric acid treatment

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(11) O. WALLACH, "Briefwechsel zwischen J. BERZELIUS und F. WÖHLER", Verlag von WILHELM ENGELMANN, Leipzig, 1901, vol. 1, pp. 244-5; 331-5. WÖHLER to BERZELIUS, Jan. 18, 1829 and Jan. 9, 1831; BERZELIUS to WÖHLER, Jan. 22, 1831.

(12) SEFSTRÖM, "Berättelse rörande göromålen vid Bergs-Skolan år 1824", *Jern-Kontorets Annaler*, 9, (part 1), 144-203 (1825).

(*) This must have been CARL RINMAN (1762-1826), son of SVEN RINMAN (1720-1792), the famous metallurgist. CARL RINMAN's son CARL was studying mining and metallurgy under SEFSTRÖM in 1824.

of the iron and in the spring of 1830 confided to BERZELIUS his belief that the Taberg iron contained a trace of an unknown metal. Because of a European journey, however, SEFSTRÖM was obliged to discontinue the work until his return in the following autumn. Because the iron contained such a minute amount of the new substance, SEFSTRÖM himself began to fear that the supposed new metal might be nothing but chromium. After dissolving more than 18½ pounds of iron from Eckersholm (1 lispund) and obtaining less than 0.1 gram of the unknown substance, he realized that he ought to have searched for it in the slag instead of the iron (3), (13). He therefore examined "the scoriae formed during the conversion of the cast into wrought iron", and by the eighteenth of November was certain that the new substance could not be chromium.

In order to have BERZELIUS' help and advice, SEFSTRÖM spent the Christmas holidays with him in Stockholm. During the three weeks of vacation, they succeeded in removing the phosphates, silica, alumina, zirconia, and iron, and SEFSTRÖM prepared a paper on the new metal, which they at first named *erian* and then *vanadium* for the goddess VANADIS (FREYA) (14).

After SEFSTRÖM returned to his teaching duties at Fahlun, BERZELIUS made a thorough study of the compounds of vanadium and determined its atomic weight. He completed this remarkable research by April 20th and published it in the *Vetenskapsakademiens Handlingar* for 1831 (15). Although he and SEFSTRÖM concluded that vanadium must be very closely related to chromium and molybdenum, it is now known to belong in Group V of the periodic system instead of Group VI. The vanadium alloys he left for SEFSTRÖM himself to investigate.

In the meantime BERZELIUS had kept WÖHLER informed of all events leading up to SEFSTRÖM's discovery of vanadium (erian), and WÖHLER had compared its properties carefully with those

(13) SEFSTRÖM to BERZELIUS, Oct. 25, 1830.

(14) SEFSTRÖM, "Om vanadium, en ny metall funnen uti stångjern som är tillverkadt av malm från Taberg i Småland," K. Vet. Akad. Handl., **1830**, pp. 255-61; SCHWEIGGER's J. Chem. Phys., **62**, 316-23 (1831).

(15) BERZELIUS, "Om vanadin och dess egenskaper," K. Vet. Akad., Handl., **1831**, pp. 1-65; Phil. Mag. (2), **10**, 321-337 (Nov., 1831); ibid (2), **11**, 7-20 (Jan., 1832).

of the unknown substance in the lead ore from Mexico. He was astonished at their similarity. On January 9, 1831 he wrote to BERZELIUS, "I enclose herewith a little powder with a ?, and wish you would find out whether it is not partly or wholly erian oxide." BERZELIUS and SEFSTRÖM soon verified WÖHLER's belief that DEL RÍO's erythronium, SEFSTRÖM's vanadium (erian), and WÖHLER's unknown substance were all identical (11), (16), (17).

In 1836 SEFSTRÖM published a geological paper (18) entitled "Investigation of the grooves with which Scandinavia's mountains are furrowed in a definite direction and on their probable origin." His "boulder-flood theory (rullstensflodteori)", based on the north-to-south direction of the rock-striae and gravel-ridges, aroused heated discussion among geologists. It was supported in the main by BERZELIUS and opposed by L. VON BUCH.

In his annual report for 1838, SEFSTRÖM stated that his students at Fahlun who were studying the blast furnace had spent most of the winter making analyses pertaining to the mining of iron and copper. They also analyzed crucibles, brass, glass, and gunpowder, and received practical training in forging, copper smelting, and mining (19).

In the same year AXEL ERDMANN, one of SEFSTRÖM's students, separated an unknown oxide from a Norwegian mineral and reduced it to "a white, rather malleable metal which SEFSTRÖM thinks is not tin" (20). ERDMANN's new metal, however, proved to be identical with C. G. MOSANDER's lanthanum.

From 1840 until his death in 1845 SEFSTRÖM took charge of the mineral cabinet, chemical laboratory, and library at the Royal School of Mines of Stockholm. In 1841 he published a paper on a method of making barometer readings independent of the

(16) WÖHLER, POGGENDORFF's Annalen, **21**, 49 (1831).

(17) M. E. WEEKS, " The scientific contributions of Don A. M. DEL RÍO," J. Chem. Educ., **12**, 161-6 (Apr., 1935).

(18) SEFSTRÖM, "Undersökning af de räfflor, hvaraf Skandinaviens berg äro med bestämd riktning fårade, samt om deras sannolika uppkomst", *K. Vet. Akad., Handl.*, **1836**, p. 141; A. G. HÖGBOM, "Den petridelauniska floden. Omkring ett hundraårsminne", *Lychnos*, **1**, 1-75 (1936). Summary in English.

(19) SEFSTRÖM, "Berättelse rörande göromålen vid Bergs-Skolan år 1838", *Jern-Kontorets Annaler*, **26**, 241-362 (1842).

(20) WALLACH, "Briefwechsel zwischen J. BERZELIUS und F. WÖHLER", vol. 2, pp. 78 and 88. BERZELIUS to WÖHLER, Dec. 28, 1838 and Feb. 1, 1839.

incompleteness of the vacuum (21). The Lindbom Prize for 1842 was awarded to him for this paper; it had previously been presented to him in 1830 for the vanadium research and in 1835 for his boulder-flood theory (22).

In 1840 and 1841 SEFSTRÖM served as president of the Swedish Academy of Sciences (22). He traveled in Germany, Austria-Hungary, and England in the interests of the Iron Corporation and the Academy, and published detailed reports in the *Jern-Kontorets Annaler* (2), (23), (24). In one of these reports he wrote (24) : "Rough and crude as the manufacture of bar iron may seem at first sight, I know of no other process which has so many niceties, which is so sensitive to outside influences, presents such a wealth of highly interesting phenomena, and offers such an extensive field for pleasant research as the preparation of bar iron in the hearth. Medicine, in which I was engaged for several years, is also a great field for investigation; but I have had just as many interesting conversations with thoughtful smiths... as I ever had among my medical acquaintances. However, it is only after a great many years of study that one arrives at such enjoyment. That is why all improvements in forging proceed so slowly. Workers who work and think at the same time are so rare that one seldom meets them... The chemical operation of the blast-furnace proceeds independently of the laborer; but the hearth cannot operate without the continual services of the smith... The guide for students which I gave them in 1836...and which I provided in as popular a form as I possibly could, was yet such hard reading that it required much more education than smiths ordinarily possess. BJÖRKMAN at Österby would have understood every word of it if he were living... All real improvement in the manufacture of bar iron must... tend to make the process less dependent on the worker..."

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(21) SEFSTRÖM, "Om ett sätt att, vid barometerobservationer göra sig oberoende af ofullkomligheten uti barometerns vacuum", *K. Vet. Akad. Handl.*, **1841**, pp. 187-96.

(22) E. W. DAHLGREN, "Personförteckningar, 1739-1915. *Kungl. Svenska Vetenskapsakademien*", ALMQVIST & WIKSELLS, Stockholm and Upsala, **1915**, 295 pp.

(23) H. G. SÖDERBAUM, "Jac. BERZELIUS. Självbiografiska anteckningar", P. A. NORSTEDT & Söner, Stockholm, **1901**, p. 162.

(24) SEFSTRÖM, "Utur Professor SEFSTRÖMS Berättelse om dess sista utländska resa", *Jern-Kontorets Annaler*, **26**, 372-421 (1842).

Professor SEFSTRÖM belonged to several scientific, mining, agricultural, archaeological, literary, patriotic, military, and manual art (sloyd) societies in Sweden and to the Natural Science Society of Heidelberg and the Royal Academy of Sciences of Berlin. According to the biographical sketch in the *Vetenskapsakademiens Handlingar* (2), he "was a man of unusually large stature, his towering height and the manly seriousness of his features gave to his whole person, the appearance of unusual strength and simplicity. In later years a marked paleness gave evidence of his continual ill-health... His character was candid and upright, his intercourse friendly and most instructive. He did not shrink from labor; on the contrary, he loved it, and neither illness nor fatigue could overcome the perseverance with which he carried on a task he had begun. Loyal to his friends, he spoke out mercilessly against those who did not share his views... As a teacher he was tireless, and infinitely kind to his students..."

Professor SEFSTRÖM's death on November 30, 1845 came suddenly as the result of a paralytic stroke. According to one of his contemporaries (2), "Swedish mining is indebted to Professor SEFSTRÖM not merely because he trained most of those who now strive for its advancement; he himself has also given it a new direction, namely the scientific, and thus lighted in Sweden a new miners' lamp, which will never be extinguished." The Swedish Academy of Sciences honored his memory with a medallion, which was struck in 1861 (19), and which it is our privilege to reproduce thanks to the courtesy of Professor JOHAN NORDSTRÖM of Uppsala. SEFSTRÖM's portrait we owe to the courtesy of the late Dr. HENRIK GUSTAV SÖDERBAUM, who had included it in his book *Jac. Berzelius Levnadsteckning* (Uppsala 1929-31).

The writer is most grateful to Professor MARY E. LARSON for her kind help with the translations from the Swedish.

University of Kansas, MARY ELVIRA WEEKS
Lawrence, Kansas,
November 1937.

The Writings of J. K. Fotheringham

A bibliography of J. K. FOTHERINGHAM's (1874-1936) *main* writings (1903-1936) appeared in *Isis* 27, 487-92. This "First List" consisted of 76 items; in addition to the titles of 6 books (items 05.1, 06.1, 15.7, 21.1, 23.2, and 28.3) and of 67 papers, notes, letters, etc., the list included two obituary notices (30.3 and 30.4) and one book review (29.1). The original bibliography compiled by R. A. SAMPSON was considerably expanded, first by G. SARTON, then by myself; finally, I checked and edited the items included in the "First List". No attempt was made, at that time, to compile a complete bibliography of J. K. FOTHERINGHAM's writings; I omitted, intentionally, a considerable number of unimportant reviews listed in my own notes; the review (item 29.1) of P. V. NEUGEBAUER's "Astronomische Chronologie" and the obituary notice (item 30.4) concerning FOTHERINGHAM's collaborator, CARL SCHOCH, were included, however, in the "First List", on account of their importance. Unfortunately, in the course of checking, adding, eliminating, and editing, half a dozen short papers and notes were omitted from the final typescript sent to the printer — the items 08.5, 09.6, 18.2, 23.4, 29.3, and 30.7 of the present "Second List"; they were listed in my own notes and should have been included among the "main writings" of the "First List". To atone for this sin of omission, I have prepared a "Second List", an Index to both lists, and a diagram correlating the yearly numbers of FOTHERINGHAM's publications with his age during the third of a century of his writing activity, 1903-1936.

An excellent biographical sketch of J. K. FOTHERINGHAM, by CHARLES SINGER, appeared in *Archeion* 19, 172-74; it is followed, on pp. 174-78, by a bibliography entitled "Articles, reviews, books and 2 letters to "The Times" written between 1903 and 1936." This bibliography is, apparently, based on FOTHERINGHAM's own notes — in checking it, I found 10 unsigned items which

could have been included only by FOTHERINGHAM or a member of his family; the bibliography is not complete, however, because 4 items of our "First List" (04.1, 15.3, 31.2, and 32.2) and one item (18.2) of our "Second List" are not included in the *Archeion* list. The *Archeion* bibliography suffers, unfortunately, from a complete lack of checking and editing, and from very poor proofreading; the items begin with the year of publication, but they are not arranged in chronological order; the year of publication (the wrong year, in the case of items 08.6, 09.7, 11.2, and 12.2) is followed by the initials or the name of the periodical (the wrong periodical, in the case of item 27.7; the name of the periodical is not given in the case of item 19.4); the volume number and the pagination are not always given (when given, they are often wrong); the wording of the titles, and the spelling and initials of proper names are often misleading; the presence of the word "stet", in four places, reveals a deplorable lack of cooperation between proofreaders and typesetters.

FIG. 1

Chronological distribution of the writings of J. K. FOTHERINGHAM published between 1903 and 1936.

Large filled circles — books; small filled circles — papers, notes, letters, etc.; open circles — reviews.

The checking and editing of the raw material stored in the *Archeion* bibliography, yielded our "Second List" which is complementary to our "First List"; the items are numbered continuously, within the year of publication, without regard to the month of publication. The "Second List" consists of 54 items; of these, 17 are articles or notes, 31 are reviews, 3 are obituary notices, 2 are letters to *The Times*, and 1 is a foreword

to a book. The 10 unsigned items, marked by an asterisk in our "Second List", include 8 reviews and 2 obituary notices. As already stated, item 18.2 is not listed in the *Archeion* bibliography. The paper by T. R. HOLMES, mentioned in my note to item 12.3, constitutes an integral part of the MANILIUS-GARROD-FOTHERINGHAM-HOLMES bibliographical group. Some of the reviews are of little importance to the historians of science, while others offer J. K. FOTHERINGHAM's corrections or comments which elevate them to the rank of original contributions.

It is reasonable to assume that the two lists, *Isis* 27, 487-92 and 29, 000-00, with their total of 130 items, include practically all of J. K. FOTHERINGHAM's published writings; readers of *Isis* who should happen to know of the existence of additional entries are hereby asked to share their information with me (1).

The diagram reproduced in FIG. 1 does not take into consideration the relative importance or length of the 130 items, or the year of writing — as opposed to the year of publication. The diagram shows that the majority of J. K. FOTHERINGHAM's publications belong to the postwar period, i.e., to the last third of his life.

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SECOND LIST OF J. K. FOTHERINGHAM'S WRITINGS

This list is complementary to the First List, *Isis* 27, 487-92.
Unsigned items are marked by an asterisk.

1908

5. The eclipse of ANAXAGORAS. *Observatory* 31, 399-402.
6.* Review of O. A. TOFTEEN's "Researches in Biblical Archaeology". *Church quarterly review* 66, 188-89.

1909

6. The Babylonian calendar. *Observatory* 32, 141.
7.* Review of W. H. HUTTON's "The Age of Revolution". *Church quarterly review* 68, 454-55.

(1) I have not seen the items published in *The Chaldaean*; the references to this elusive periodical are given here as they appear in the *Archeion* list; they are obviously incomplete, and they may contain errors.

1911

2. Calendar (Introductory). JAMES HASTING's *Encyclopaedia of religion and ethics* 3, 61-64.

1912

1. Astronomical evidence for the date of the Crucifixion. *Churchman* 26, 703-09.
2. Review of G. COSTA's "La cronologia romana preflaviana" and "I fasti consolari romani dalle origini alla morte di C. GIULIO CESARE". *Classical review* 26, 61-62.
3. An astronomical poet. *Nature* 89, 239-40.
   Review of H. W. GARROD's edition of "MANILI Astronomicon Liber II". For a discussion of GARROD's use of FOTHERINGHAM's opinions concerning the birthday of AUGUSTUS and the Julian calendar, see T. R. HOLMES, *Classical quarterly*, 6, 73-81, 1912.

1914

1. Foreword to JOSIAH WALKER NICHOLSON's "Crosby Garrett, Westmorland. A history of the manor..." Kirkby Stephen, J. W. BRAITHWAITE & Sons.

1918

2. Note on HIPPARCHUS. *Observatory* 41, 155-56.

1920

8. Astronomical comments on Dr. HOLMES's note on the Julian calendar. *Classical quarterly* 14, 97-99.
9. TYCHO BRAHE. *Nature* 105, 672-73.
   Review of TYCHO BRAHE, Opera omnia, vol. VI.

1921

4. The naked eye in the desert. *The Chaldaean*, 29.
5. Review of A. EDDINGTON's "Space, Time and Gravitation". *The Chaldaean*, 607.
6. Review of TYCHO BRAHE, Opera omnia, vol. V, fasc. 1. *Nature* 108, 237.

1922

1. Review of A. H. SALONIUS' "Zur römischen Datierung". *Classical review* 36, 190.
2.* Review of A. PHILIP's "The Calendar : Its History, Structure, and Improvement". *Nature* 109, 203-04.

1923

4. The probable error of a water-clock. *Classical review* 37, 166-67.
5. Dr. KARL MANITIUS. *Observatory* 46, 262-63.
   Obituary notice.
6.* Astrology of comets. *Nature* 111, 179.
   Review of TYCHO BRAHE, Opera omnia, vol. IV.
7. Review of O. GERHARDT's "Der Stern des Messias". *Journ. theol. studies* 24, 469.
8.* Review of J. FR. SCHROETER's "Spezieller Kanon der zentralen Sonnen- und Mondfinsternisse". *Nature* 112, 389.
9. Review of the Halley Lecture by J. JEANS, "The Nebular Hypothesis and Modern Cosmogony". *The Chaldaean.*

1924

2. TYCHO BRAHE's observations. *Nature* 114, 151-52.
   Review of TYCHO BRAHE, Opera omnia, vol. X.

1925

4.* Review of TYCHO BRAHE, Opera omnia, vols. VII and XI. *Nature* 115, 760.

1926

5. Spring. *The Chaldaean* no. 23, 4-7.
6.* Dr. J. L. E. DREYER. *Nature* 118, 454.
   Obituary notice.
7.* Review of F. H. COLSON's "The Week". *Oxford magazine* 45, 209-10.

1927

4. Changes in the length of the day. *Nature* 119, 318-19.
5. Notes on astronomical articles in PAULY-WISSOWA's "Real-Encyclopädie", vol. III[A]. *Observatory* 50, 131-32.
   Notes on W. GUNDEL's articles, "Sirius" and "Skorpios".
6. TYCHO BRAHE. *Nature* 120, 578-79.
   Review of TYCHO BRAHE, Opera omnia, vols. VIII, XII, and XIII.
7. Review of F. H. COLSON's "The Week". *Journal of Roman studies* 17, 134-35.
8. Review of W. KUBITSCHEK's "Grundriss der antiken Zeitrechnung". *Journal of Roman studies* 17, 242-43.

1929

3. Ancient eclipses. *Encyclopaedia Britannica* (14th ed.) 7, 912-14. Part of the article, "Eclipse".
4. The Attic calendar. *Classical review* 43, 20-21.
   Review of B. D. MERITT's "The Athenian Calendar in the Fifth Century".

1930

7. The two-thousandth anniversary of VIRGIL's birth. *Classical review* 44, 1-3.
8.* HERBERT HALL TURNER. *Oxford magazine* 49, 13-15.
   Obituary notice.
9. Ancient astronomy and chronology. *Oxford magazine* 49, 48-50.
10. JEROME and EUSEBIUS. *Classical review* 44, 243.
   Review of R. HELM's "HIERONYMUS' Zusätze in EUSEBIUS' Chronik und ihr Wert für die Literaturgeschichte".

1931

3. A new history of astronomy. *Nature* 128, 986-87.
   Review of E. ZINNER's "Die Geschichte der Sternkunde".

1932

3. THOMAS FLATMAN's horoscope. *Bodleian quarterly record* 7, 8-10, 1 fig.
4. Date of the crucifixion. *The Times*, December 31, p. 9, col. 5.

1933

3. Accelerations and fluctuations of the sun and moon. *Empire survey review* 2, 120.
4. Astronomy in Oxford. I — The Astrographic Star Catalogue. *Oxford magazine* 52, 217.
5. Review of the 1933 reprint of R. WOLF's "Geschichte der Astronomie" (1877). *Mathematical gazette* 17, 340.
6. Astrolabes. *Nature* 131, 819-21.
   Review of R. T. GUNTHER's "The Astrolabes of the World".

1934

1. The evidence of astronomy and technical chronology for the date of the Crucifixion. *Journ. theol. studies* 35, 146-62.
2. Review of E. M. ANTONIADI's "L'astronomie égyptienne". *Journ. Brit. Astr. Assoc.* 44, 280-81.
3. Review of E. BICKERMANN's "Chronologie". *Classical review* 48, 191.

1935

3. Review of "An Ephemeris of 467 A. D." by H. D. CURTIS and F. E. ROBBINS. *Classical review* 49, 242.

1936

2. Indian references to the Zodiac. Date of inscriptions. *The Times*, March 27, p. 10, col. 4.
3. Review of W. B. DINSMOOR's "The Archons of Athens in the Hellenistic Age". *English historical review* 51, 354-55.
4. Review of "La jeunesse de la science grecque" by A. REY and of "Exakte Wissenschaften" by A. REHM and K. VOGEL. *Journal of Hellenic studies* 56, 104-05.
5.* Numerical methods in late Babylonian astronomy. *Nature* 138, 849. Review of OTTO NEUGEBAUER's "Jahreszeiten und Tageslängen in der babylonischen Astronomie" (*Osiris* 2, 517-50).

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Astronomy according to the Jews

An astrological treatise, entitled *Astronomia secundum Iudeos* or *secundum Ebreos*, to which attention seems not to have been called hitherto, occurs in a Latin manuscript at the British Museum." The manuscript is made up of various works of ALBUMASAR, ALKINDI, AOMAR and MESSAHALA translated from the Arabic by such twelfth century translators as ROBERT OF CHESTER, JOHN OF SPAIN, PLATO OF TIVOLI and HUGH OF SANTALLA, and other works of astronomy and astrology. The manuscript seems a composite (2) and is in different hands but appears to be predominantly of the thirteenth century. Our treatise comes between the astrological work attributed to ARISTOTLE or PTOLEMY which opens, "Signorum alia sunt masculina alia feminina..." (3) and the Flores of ALBUMASAR, (4) but is

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(1) COTTON Appendix VI. I have previously adverted to this MS in *A History of Magic and Experimental Science*, I, 643, 646; II, 76, 82, 255-56. 485-86, 925.

(2) Its later leaves are in the earlier hand and have been renumbered.

(3) See THORNDIKE and KIBRE, *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin*, 1937, col. 691 ; and my *History of Magic and Experimental Science*, II, 255-56. In COTTON Appendix VI, the work is followed at fols. 20 v, col. 1-21 r., col. 2 by a commentary upon it, and by some brief tracts or chapters at fols. 29-30.

(4) At fols. 45 r, col. 2- 53 r, col. 2. "Hic liber est quem collegit de floribus Albumasar de floribus que significant res superiores in rebus inferioribus et quid sit in revolutione annorum dierem et mensium. Et erat hunc librum deferens secum in peregrinationibus quia posuit in eo flores rerum et cetera que placuerunt ei." After this introductory paragraph comes the rubric, "Incipiunt flores Albumasar," and usual incipit, "Dicit Albumasar Oportet te scire dominum..." The work might seem to end at fol. 50 r, col. 1, with the words, "...quia ego non posui in hoc libro aliquid nisi quod iam expertus sum et feci multis vicibus... Feci autem quia coactus sum a quibusdam in hoc et post nequaquam separavi eum a me propter levitatem et brevitatem operis et veritatem eorum que collecta sunt in eo ex floribus et secretis astrorum." But then is added the statement, "Etiam quod hic sequitur tractatus credo quod est de floribus Albumasar. Then follow a "Tractatus in terre motu et diluviis", a "De coniunctione saturni

immediately preceded by "six tables," which are really as many paragraphs on the aspects of the moon with each of the other planets and seem to be drawn from or based upon ALBUMASAR (5). Then we read : "Here begins the Astronomy according to the Jews and their books. For the sake of triplicitates and distinction of the planets according to properties and houses and signs in which they rule this chapter is placed here" (6). After this rubric the text proper opens : "It should be noted that there are twelve signs and they are distinguished according to the natures of the elements..." (7). In the course of this chapter nativities are discussed according to the twenty-eight mansions of the moon (8). What seems to be the next chapter deals with events after birth (9). A third section (10) is identical with the Breviarium ALHANDREI (11), which thus does not seem to occur here in its usual setting. It is followed by a fourth section on astrological interrogations (12), after the end of which is the concluding rubric, "Ends astronomy according to the Jews in

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et martis", and a "Capitulum de stellis fixis quibus aliquando planete iunguntur". The whole ends, "...sit luna infortunata a sole et erit melius. Expliciunt flores Albumasar."

(5) At fols. 31 r, col. 1-31 v, col. 2, opening and closing : "Nota bene has sex tabulas que sequuntur secundum Alb"... Nota bene has tabulas sex supradictas de aspectibus lune et singulorum planetarum."

(6) Fol. 31 v, col. 2 : "Hic incipit astronomia secundum Iudeos et libros eorum. Propter triplicitates et distinctionem planetarum penes proprietates et domos et signa in quibus dominantur ponitur hic istud capitulum."

(7) *Idem*, "Notandum quod duodecim sunt signa et distinguuntur penes naturas elementorum..."

(8) At fols. 34 r, col. 2-37 v, col. 2.

(9) At fol. 42 r, col. 2 : "...Si in malis nequaquam. Explicit ista materia secundum Ebreos astronomos." Then the rubric, "Hic incipit de accidentibus nati", and incipit, "Diximus superius iuxta quatuor elementorum..." It ends at fol. 44r, col. 1 : "...qui nascitur orphanus sapiens xi xii."

(10) At fol. 44r, col. 1 : rubric, "Scientia investigationis occultorum per computacionem"; incipit, "Nomen aut cognomen hominis cuiusque inauditum..."

(11) Concerning it see my *A History of Magic and Experimental Science*, I, 714; and, more recently and fully, A. VAN DE VYVER, "*Les plus anciennes Traductions latines médiévales (X^e-XI^e siècles) de Traités d'Astronomie et d'Astrologie*", *Osiris*, I (1936), 658-91, particularly pp. 667 and 679-80. VAN DE VYVER does not note our present manuscript.

(12) At fol. 44v, col. 1 : rubric, "Ut cito scias de quo vis habere notitiam."

the science of nativities by hours of day and of night and the mansions of the moon, and concerning interrogations and responses according to the Jews" (13).

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LYNN THORNDIKE.

(13) At fol. 45r, col. 1-2 : "...rerum vobis erit adulta copia." Then the rubric, "Explicit astronomia secundum Iudeos in scientia nativitatum secundum horas diei et noctis et mansiones lune et de interrogationibus et responcionibus secundum Iudeos."

Some notes on Chinese musical art

He who knows music is close to the rites.
To know music and rites, means to possess virtue.
SSŬ-MA CH'IEN

The scarce literature on the history of Chinese music, its theoretical foundations and the development of a proper technique of musical composition, has been recently enriched by the publication of a thorough scientific study of the subject : JOHN HAZEDEL LEVIS' *Foundations of Chinese Musical Art* (1). The young author, who is well known as a lecture-recitalist in China as well as in the United States, was born and brought up in China, and lived there for the greater part of his life — more than a quarter of a century; his approach to the spirit of Chinese music is naturally essentially different from that of his European predecessors. Among the latter, half a century ago, J. A. VAN AALST wrote a treatise (2) which is remarkable from the purely scientific point of view, but he does not make it a secret that he is by no means favorably impressed by the beauty of Far-Eastern music; similarly, GEORGE SOULIÉ (3) in his work strictly denies the existence of any art of composition in China. No doubt that both VAN AALST and SOULIÉ have made valuable contributions to our knowledge of scientific facts, but it must always be considered a dangerous, not to say preposterous, attitude if an author discusses his artistic subject as a mere monstrosity without making an attempt of penetrating beyond the surface, in other words, if only his scientific interest participates in the matter, while his heart remains unaffected.

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(1) HENRI VETCH, Publisher, The French Bookstore, Peiping, China, 1936, XIII and 233 pp., illustrated. Selling price in China: Ch. $ 15.00, in North America : U.S. $ 6.00, in England : 21/—.

(2) *Chinese Music*, Published by order of the Inspector General of Customs. Imperial Maritime Customs, II. — Special Series : No. 6 (1888). Re-issued and sold by the French Bookstore, Peiping, under the authorithy of The Inspector General of Customs, 1933.

(3) La musique en Chine, *Bulletin de l'Association franco-chinoise*, Paris, 1910-11.

A musically educated European who has never listened to Oriental music, will undoubtedly not enjoy the first Chinese recital he attends; he will find it disgusting, a strange and tiresome cacophony, and, physically and mentally worn out, he possibly may need several hours of Western classical music, to find rest and consolation, and to forget about his bitter experience. Our friend will hardly be able to refrain from comparing the monotonous and rhythmically poor Chinese melodies with the abundant richness of European melodic movement and rhythmical structure, or comparing consistently offending progressions in parallel fourths, fifths, or octaves (all untempered, of course), produced on two simultaneously played strings of the *ch'in* (2109) or *sê* (9599), with the beautiful polyphonic pattern of Western compositions based on our tempered scale and worked out according to the rules of the theories of harmony and counterpoint.

However, such a comparison is of no use at all. Let us frankly admit that the European music is more highly developed than the Chinese, but let us also, at the same time, carefully avoid the question of superiority or inferiority, as this necessarily leads away from those points which are of true interest. Undoubtedly, Chinese music serves just the same essential purpose as European, that of talking immediately to the hearts of those whom it is destined for. And we may be sure that there is no measurable difference in the effect produced by Chinese music played before a Chinese audience, and that which European music exercises on Western audiences. But do not let us try to convince one or the other of our Chinese friends of the eternal beauty of Western music by inviting him to listen to a WAGNER opera or BRUCKNER symphony. In case it is his first trial, he will certainly suffer just as much as we did in our first Chinese musical recital. Of course, I do not want to pretend that there is no bridge between Oriental and Occidental music, no way of mutual understanding, but it may be taken for granted that real understanding and intuitive perception of the hidden beauty of foreign music is not attained in one day.

The present article is partly based on the very fertile theories developed in Mr. LEVIS' book. Many of his discoveries, at which he arrived through a careful study of rare documents of Chinese musical notations, are of such an importance and

general interest that this concise analytical summary, which appears instead of a critical review, needs no justification. Some explanatory sections are added; critical remarks will mostly be found in the footnotes.

The salient point in the treatment of his subject is the author's theory of poetry and music having been an inseparable unity from the earliest times in history. This is certainly true also of countries other than China, but due to the peculiar "musical" character of the Chinese language itself (the tones or "neumes", in LEVIS' terminology), the musical composition is in principle preconceived by the poet; all that is left to the composer, is to carry out in a musically satisfactory way the rules inherent in the poet's words.

In consequence of this important statement, which will be illustrated later by several examples, the author divides his work into three main parts :

I. The origin of the musical art, which springs from the musical elements in the Chinese language;

II. The development of the art : How the art grew from ancient times through the understanding and use of the elements of the language;

III. Examples of highest development : The actual use of the musical elements of the language in the composition of music for poetry (analyses of composition and forms).

A concluding fourth part is devoted to the question of the value of the art in the modern world : The ancient art as a living form of musical creation. This part, though very stimulating, is of a more speculative nature, dealing with the possibilities of amalgamating Far Eastern and Western music, and superimposing the foreign element of harmony on the ancient system of musical forms. It is Zukunftsmusik in the concrete sense of the word rather than historical deduction, and this is therefore not the place for discussing it in extenso. However, it may be mentioned here that Mr. LEVIS himself has applied the ancient Chinese forms and principles of musical structure to his own compositions (which are unfortunately unknown to me). We are looking forward with the greatest interest to their publication, as this appears to be the first serious attempt made in this direction. Indeed, other attempts of the kind have been made, as for instance,

more than a century ago, by CARL MARIA V. WEBER in his *Turandot Overture* (1809) where he uses a Chinese melody limited to the pentatonic scale (an interesting, though somewhat superficial experiment). GUSTAV MAHLER's unique *Lied von der Erde* (1911, posthumously published 1912) composed over half a dozen poems from the T'ang era — undying flowers of lyric poetry, though badly mutilated by the translation — lies on another line. A European audience would readily accept the artist's strange tonal effects as "Chinese" (just as the orang-outang's cries, in POE's *Murders in the Rue Morgue*, are identified with all possible languages unknown to the various witnesses) but they would hardly sound particularly familiar to a Chinese audience and, thus, immediately touch their hearts.

1. Musical tradition in China comprises thousands of years. Music was counted among the six Confucian arts, and the earliest manifestations of Chinese poetry, the odes of the *Shih ching*, are clearly recognizable as *songs*; they were inseparably joined with music. Also the beginnings of theoretical considerations about music must be dated back to a very high antiquity. The earliest theory of tonal proportions, which in principle was never changed during the whole of Chinese history, shows a striking similarity with that of the Pythagoreans. It is based exclusively on the consonance of the fundamental tone (say *C*) with its perfect fifth (*G*); all other tonal proportions are considered dissonances (4). In order to determine such proportions, the Chinese did not use the monochord, as did the Greeks, but twelve tubes of different lenght called *lü* (7520) which means "rules", "principles", or in this connection, "pitch-pipes". The longest which emitted the fundamental note (its absolute pitch is, of course, unknown and also irrelevant (cf. p. 78, note 8); we shall identify it with the *C* of our scale), is reported to have measured 9 inches. A tube reduced to two-thirds of its length, i.e. 6 inches, will then emit the

(4) On this, most of the ancient peoples seem to have agreed. A remarkable exception from the rule is formed by the Persian-Arabic *mathal* "messel" theory, as described in AL-FĀRĀBĪ's treatise on the theory of music (*Kitāb al-mūsīqī*) which recognizes the major and minor thirds, and even the major and minor sixths, as consonances. As a metaphysical reason for the Chinese theory of the fifth being the sole consonance, we read that two sounds which are in the proportion of 3 to 2 harmonize as perfectly as heaven and earth, because 3 is the attribute of heaven, and 2, that of earth.

perfect fifth (*G*) of the fundamental note. The next step yields a tube of four inches emitting *d*; as this lies above the octave of the fundamental, the length of the pitch-pipe is taken double (8 inches), and thus *D* is obtained (5).

It appears that, to begin with, this procedure was repeated only four times and that its sixfold application which yields a heptatonic gamut belongs to a somewhat later period (6). At least it can be stated that the pentatonic (anhemitonic) scale : *C. D. E.. G. A..(C)*, has played, throughout the ages, a particularly important part. In fact, to this day, ancient temple melodies as well as popular songs, still give a marked preference to the pentatonic gamut (*6a*).

Of course, the tones produced in this way are not tempered. To the Western ear, some of them sound too flat, some too sharp, and the octave in particular exceeds the ratio of 2 to 1 by that of $\frac{531441}{524288}$ (i.e. $\frac{9^6}{8^6} : \frac{2}{1}$), the well-known "ditonic comma" of the Pythagoreans. It must, however, be stated that the Chinese musicians themselves were aware of the imperfectness of their untempered scale. After a number of unsuccessfull endeavours made during more than sixteen centuries (*6b*), the prince CHU

(5) The length of 9 inches for *huang-chung* was, of course, chosen for practical, mathematical, reasons only. The method of determining the relative pitch of the *lüs* according to the ratio 2 : 3, or 4 : 3, is found for the first time in the "Spring and Autumn" of LÜ PU-WEI (*Lü-shih Ch'un-ch'iu* 7520, 9978, 2854, 2302) dating from the third century B.C.; this book, however, reports that *huang-chung* was a thick bamboo pipe measuring 3 inches 9 lines (3.9"). The first mathematical calculation of the relative lengths of the twelve *lüs* appears, a century later, in the *Shih-chi* (9893, 922), the work of the great historian Ssū-ma Ch'ien 10250, 7576, 1711).

(6) The heptatonic scale : *C. D. E. F♯ G. A. B (C)*, obtained according to this method, is reported to have been introduced during the early Chou era. It is mentioned for the first time in the work *Kuo Yü* (6609, 13626) of the fourth century B.C., and has been in use since as a basis of musical composition. This does not stand in contradiction with the fact that all the twelve *lüs* (our "chromatic" gamut) were known at the latest about the same time, or even in a much earlier period. Their invention is attributed to HUANG TI. In literature, their names and arrangement occur equally for the first time in *Kuo Yü*. But the chromatic scale never served as a basis of composition; it was used exclusively for the purpose of transposing music-pieces from one key into another.

(*6a*) This is true of Southern Chinese popular music at least. In the North, the heptatonic scale predominates over the pentatonic.

(*6b*) Cf. WANG KUANG KI, Über chinesische Musik, *Sinica*, Vol. II (Frankfurt a.M., 1927), pp. 136-38.

Tsai-yü (2544; 11485; radical 32 + 13659) of the ruling Ming family, in the year 1596, set forth a theory of tempered intonation, by which he anticipated Andreas Werckmeister's famous discovery of 1691 (7) by almost a century. Unfortunately, Chu Tsai-yü's fundamental innovation seems to have fallen into oblivion pretty soon, and it certainly never came into general use.

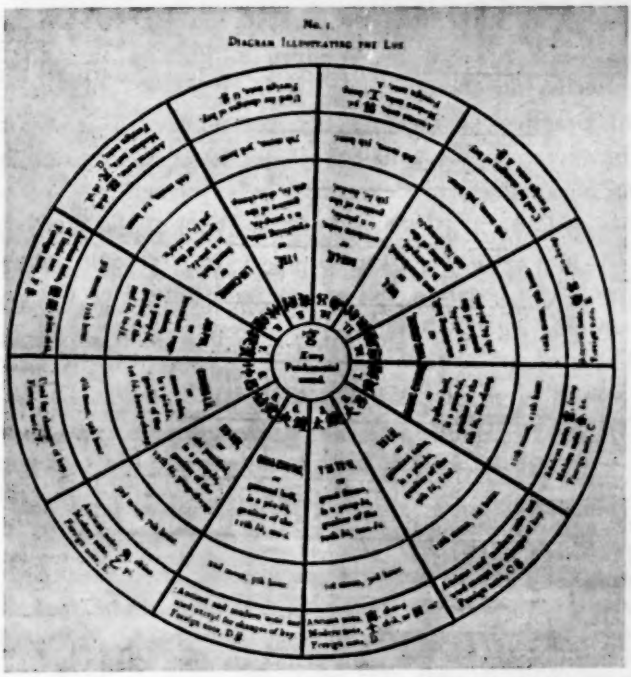

Diagram N° 1.

But at least as far as octaves are concerned, Chinese string instruments [as the lute, *ku-ch'in* (6188, 2109)], nowadays use perfectly tuned intervals. Too sharp octaves, or other intervals offending our ear, will only be perceived in certain keys, when it is not possible to make recourse to the open strings; in corresponding cases, however, our Western guitars, lutes, or mandolines,

(7) *Musikalische Temperatur, oder deutlicher und wahrer mathematischer Unterricht, wie man durch Anweisung des Monochordi ein Klavier, sonderlich die Orgelwerke, Positive, Regale, Spinetten u. dgl. wohltemperiert stimmen könne.*

suffer from just the same weakness; for the sake of justice this must be admitted.

The twelve *lüs* forming the twelve half-steps of the chromatic scale, were, of course, divided into *yin* and *yang lüs*, those of even numbers being *yin*, the odd numbers, *yang* (7*a*). Furthermore, they were attributed to the twelve moons of the year, the twelve hours of the day, and so on. Their names, attributes, and Western equivalents, are illustrated by diagram no. 1 (8).

It has been asserted by Western authorities that the names of the twelve *lüs*: ***huang-chung***, ***ta-lü***, ***t'ai-ts'u***, etc., "are solely used in practice to indicate the key-note of a composition". This, however, is only a half truth, as LEVIS points out, because at least one remarkable exception was formed by the musical notations of CHIANG K'UEI (8*a*) (1233, 6507) of the Sung dynasty, where the first syllables of the names of the twelve *lüs* were consistently used as a notation, not as key-notes only (see the examples given on pp. 85 and 87).

2. The ancient notation of the five tones of the pentatonic gamut consisted of the five syllables ***kung*** (*C*), ***shang*** (*D*), ***chiao*** (*E*), ***chih*** (*G*), ***yü*** (*A*). (For the Chinese ideograms see diagram no. 1, in the outer rim). In the heptatonic gamut, the two additional

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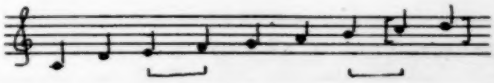
(7*a*) Thus, if *C* be the fundamental, the *yang lüs* would be : *C*, *D*, *E*, *F*♯, *G*♯, *A* , and the *yin lüs* : *C*♯, *D*♯, *F*, *G*, *A*, *B*. The generation of the twelve lüs from the fundamental is then explained as follows : The *yang* tone *C* "marries a wife", i.e. generates its dominant, the *yin* tone *G*; this, in turn, "gives birth to a son", i.e. generates its subdominant, the *yang* tone *D*, and so on. In the special case of the pentatonic gamut, we thus arrive at the "grandson" *E*, but this unfortunate, for purely euphonious reasons, is not allowed to marry its *B*. This drawback is remedied in the heptatonic scale only.

(8) From VAN AALST, *op. cit.*, p. 9. For practical reasons, the fundamental note is again called "*C*". Père AMIOT assumes *F* to be the equivalent of the Chinese fundamental (*huang-chung*), although his reasons for this choice do not seem to be very convincing. In the modern flute, *hsiao* (4321), the ground note approximates to *D*, on the horizontal, *ti-tzŭ* (10939, 12317), to *A*. As results from the numerous measurements carried out by Professor SCHÜNEMANN of the Staatliche Hochschule für Musik in Berlin, the fundamental tone of all kinds of musical instruments of a great many different peoples, from Southeastern Asia to South America, corresponds to our *F*♯. From this fact, H. TREFZGER, Die Musik in China, *Sinica*, Vol. XI (1936), p. 187, concludes that *F*♯ also, already in the remote times of the beginnings of Chinese Music, represented the "diapason normal" or absolute pitch of *huang-chung*. Of course, such an hypothesis can neither be confirmed nor refuted.

(8*a*) LEVIS, *op. cit.*, consistently writes "KUEI" instead of "K'UEI".

tones, *F*♯ and *B*, are named *pien* (9210) *chih*, "modified *G*" (8*b*), and *pien kung*, "modified *C*", respectively, the term *pien* indicating the half-tone step. These two "modified notes" were mostly used as passing tones only, but there also exist compositions in which the same importance is conceded to each of the seven tones of the scale. This heptatonic scale, like our major diatonic scale, consists of five full- and two half-tone steps; but, while in the Western gamut the first half-tone stands between the third and fourth notes, it is found in the Chinese between the fourth and fifth degrees, as in the Lydian church-mode (9) :

During the Mongolian invasion, a new scale was brought to China by the conquerors which was in principle identical with our major scale, or also the Ionian mode, the first half-tone step taking place between the third and fourth degrees :



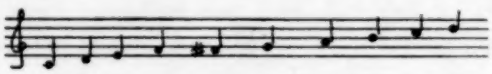
For this new scale, another notation came into general use which, however, contrary to the opinion of earlier authorities (as VAN AALST), was already known and used for the ancient heptatonic scale during the Sung era, considerable time before the Mongolian period. It consisted of nine simple characters (see diagram no. 1, outer rim) : *ho* (*C*), *ssŭ* (*D*), *i* (*E*), *shang* (*F*), *ch'ih* (*G*), *kung* (*A*), *fan* (*B*), [*liu* (*c*), *wu* (*d*)]. The two last denote the octaves of *ho* and *ssŭ* respectively; they were introduced for the sake of convenience because most of the musical compositions used to be restricted to the interval of a ninth. In exceptional cases, when higher tones are required, these are indicated by prefixing the radical no. 9 (*iên*, "man") to the character which,

(8*b*) LEVIS, *op. cit.*, p. 69, obviously confuses pien [4] (9210), "to change", "modify", with pien [1] (9192), "side", and therefore translates "side" *G*, "side" *C*.

(9) LEVIS consistently speaks of "Ancient Greek modes", when he means *church-modes*. It is sufficiently well known that the Ancient Greek and the church-modes have nothing but the names in common.

when standing isolated, would denote a tone of the fundamental octave (10).

In order to reconcile the new Mongolian scale with the ancient Chinese, the Mongolian rulers decreed that a kind of hybrid gamut mixed of the two be used, in which *F* as well as *F*♯ should appear; for denoting *F*♯, a new sign, *kou* (6135), was introduced :



ho ssŭ i shang *kou* ch'ih kung fan liu wu (11)

This artificial and unnatural scale, however, apparently never became popular among the Chinese musicians. During the centuries subsequent to the Mongolian era, the Mongolian scale came into general use, and to this day it forms the basis of practically all popular Northern Chinese melodies.

The following diagram no. 2 (12) gives a synopsis of the main musical notations and their Western equivalents (13).

CHINESE WITH APPROXIMATE WESTERN EQUIVALENTS

1. Chromatic Scale	C	C♯	D	D♯	E	F	F♯	G	G♯	A	A♯	B
2. *Lü* notation	黃	大	太	夾	姑	仲	蕤	林	夷	南	無	應
3. Ancient 5-tone notation	宮		商		角			徵		羽		
4. Ancient 7-tone notation	宮		商		角		變	徵	徵	羽	變	宮
5. Modern 7-tone	合		四		一	上		尺		工		凡
6. Modern 12-tone	合	𠄎	四	𠂉	乙	上	勾	尺	𠂉	工	𠂉	凡
7. Sung notation	ㄙ	ㄚ	ㄚ	一	一	𠂇	ㄙ	ㄟ	ㄱ	ㄱ	リ	リ

Diagram N° 2.

(10) In the ancient notation, the higher octave was denoted by the character *ch'ing* (2188) prefixed to any tone of the fundamental octave; for the lower octave, the character *cho* (2409), or sometimes *hsia* (4230) was employed.

(11) I do not quite understand for what reasons Mr. LEVIS, on p. 79, makes *F*♯ (*kou*) precede *F*♮ (*shang*).

(12) From LEVIS, *op. cit.*, p. 91.

(13) For the Sung notation (No. 7) see the researches published by HSIA CH'ÊNG-CH'OU in the *Yenching Journal of Chinese Studies*, No. 12, December, 1932.

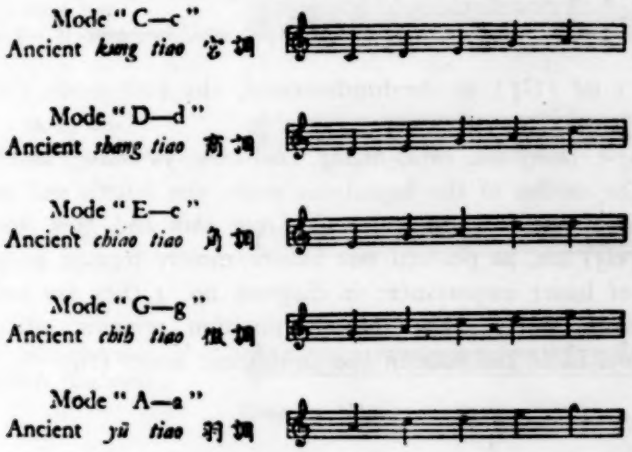
3. It is important and interesting enough, though not yet generally recognized in modern works, that Chinese musical theoreticians not only distinguish between the pentatonic scale : *C, D, E, G, A*, and the two heptatonic scales : *C, D, E, F♯, G, A, B*, and *C, D, E, F, G, A, B*, but also consistently refer to the different *modes* of both the pentatonic and heptatonic scales. The modes of the latter are nothing but the well-known church-modes (14) which, in the West, were mentioned for the first time in the writings of FLACCUS ALCUIN (8th century) and AURELIANUS REOMENSIS (9th century). Thus there are 60 Chinese pentatonic modes, namely the five modes of diagram no. 3 (15) played in all the twelve keys of the chromatic scale, and 84 heptatonic modes, i.e. the seven modes of diagram no. 4 (16) in the twelve different keys. It is, therefore, a complete misunderstanding to consider the 60 or 84 scales to be "exaggeratedly large sets of tones", as has been recently done by Mr. JOSEPH YASSER (17).

Mode " C—c "
Ancient *kung tiao* 宮調
Mode " D—d "
Ancient *shang tiao* 商調
Mode " E—e "
Ancient *chiao tiao* 角調
Mode " G—g "
Ancient *chih tiao* 徵調
Mode " A—a "
Ancient *yü tiao* 羽調

Diagram N° 3.

(14) Extrinsically, the Chinese modes can, of course, also be paralleled with the Ancient Greek modes, but it must be remembered that the Greek scales theoretically are obtained in an entirely different way (by descending tetrachords), whereas there is a striking congruence between the Chinese and the church-modes, also as far as theory is concerned. In LEVIS' work, always read "church-modes" instead of "Ancient Greek modes". See note 9.

(15) From LEVIS, *op. cit.*, p. 72.

(16) From LEVIS, *op cit.*, p. 73.

(17) *A Theory of Evolving Tonality*, New York, 1932.

A method of indicating the shifting intervals of the five modes of the pentatonic scale given in Diagram no. 3 and of their eleven transpositions into all possible keys, was very conveniently obtained by combining the syllables of the ancient five tone notation : *kung, shang, chiao, chih, yü,* with the first syllables of the names of the twelve *lüs* : *huang, ta, t'ai, chia, ku, chung, jui, lin, i, nan, wu, ying.*

Thus, if *huang chung* (*C*) be the fundamental, the notation will run as follows :

Mode "C-c" : kung-huang, shang-t'ai, chiao-ku (18), *chih-lin, yü-nan.*
Mode "D-d" : shang-huang, chiao-t'ai, chih-chung, yü-lin, kung-wu.
Mode "E-e" : chiao-huang, chih-chia, yu-chung, kung-i, shang-wu.
Mode "G-g" : chih-huang, yü-t'ai, kung-chung, shang-lin, chiao-nan.
Mode "A-a" : yü-huang, kung-chia, shang-chung, chiao-lin, chih-wu.

For *ta lü* (*C♯*) as the fundamental, the notation would be :

Mode "C♯-c♯" : kung-ta, shang-chia, chiao-chung, chih-i, yü-wu.

Mode "D♯-d♯" : shang-ta, chiao-chia, chih-jui, yü-i, kung-ying.

For *i tsê* (*G♯*) as the fundamental, the first mode (*G♯-g♯*) would run :

Kung-i, shang-wu, chiao-huang, chih-chia, yü-chung, and so on.

In the modes of the heptatonic scale, the fourth and seventh degrees of the fundamental scale (*pien chih* and *pien kung* respectively) are, as pointed out before, mostly treated as passing tones of lesser importance; in diagram no. 4 they are indicated by smaller notes. The musical notation remains, of course, the same as in the case of the pentatonic scales (19).

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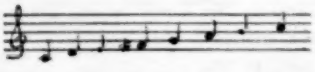
(18) LEVIS, *op. cit.*, p. 72, l. 23, erroneously gives "*chiao-chung*" as denomination of the third degree.

(19) In this diagram, it appears to be somewhat confusing that Mr. LEVIS, in order to avoid *F♯*, has transposed the fundamental tone *C* of diagram n° 3, into *F*. It would have been more consistent and better for direct comparison, to start with the "Lydian" mode, with *C* as the fundamental :

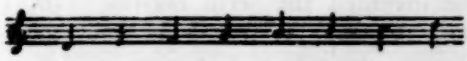


as this is the heptatonic *kung-tiao* directly corresponding to the pentatonic of diagram no. 3. This would have been so much the more justified, as the "Lydian"

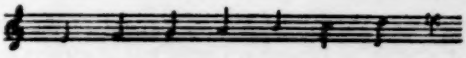
4. To this point we have been able to state that the system of Chinese music does at least not fundamentally disagree with that of the West; seen from the evolutionary viewpoint, there even exist striking similarities and parallels between the two : according to various ancient authors, as ARISTOXENOS, PLUTARCH, and others,

Ancient : *chih tiao*
Mode C-c (Ionian)

Ancient : *yü tiao*
Mode D-d (Dorian)

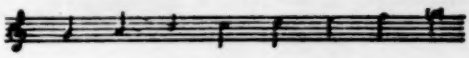


Ancient : *pien kung tiao*
Mode E-e (Phrygian)

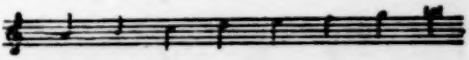


Ancient : *kung tiao*
Mode F-f (Lydian)

Ancient : *shang tiao*
Mode G-g (Mixo-Lydian)



Ancient : *chiao tiao*
Mode A-a (Aeolian)



Ancient : *pien chih tiao*
Mode B-b (Locrian)

Diagram N° 4.

the archaic Greek temple melodies were also based on a strictly anhemitonic, pentatonic scale from which the heptatonic scale was later developed; in the West as in the East, the chromatic gamut was known and subjected to theoretical discussions, but in

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mode (*kung tiao*), up to the time of the Mongolian invasion, was the unrivalled chief mode of Chinese compositions.

The Chinese spatial notation of this scale would run : *kung-huang, shang-t'ai, chiao-ku, pien chih-jui, chih-lin, yü-nan, pien kung-ying*; whereas, in Mr. LEVIS' example, it would start with "*kung-chung, shang-lin*", the fundamental *lü* not being *huang-chung* (*C*), but *chung-lü* (*F*).

neither place it generally could play the rôle of a basis of musical composition. But, while in the West nobody even thought of the possibility of employing other tones than those of the chromatic gamut (19*a*), a Chinese composer of the Sung era, CHIANG K'UEI whose name we already mentioned, made the extremely interesting and novel attempt of introducing tones finer than a semitone into his musical compositions. For these fractional tones which he defines to be "a little higher than the neighbouring regular tone" without indicating their exact pitch, he invented the term *chê-tzŭ* (550, 12324), literally translated "turning note". In one and the same composition, there appear at the most two such fractional tones in addition to the seven tones of the heptatonic scale. Hence we are theoretically entitled to speak, as Mr. LEVIS does, of a nine tone scale (enneatonic scale) of which only seven tones belong to the normal chromatic division of the octave interval. From four of CHIANG K'UEI's songs, Mr. LEVIS derived the following four types of scales (referred to *C* as fundamental) (20) :

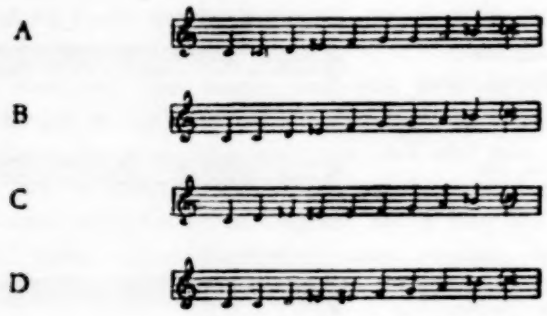
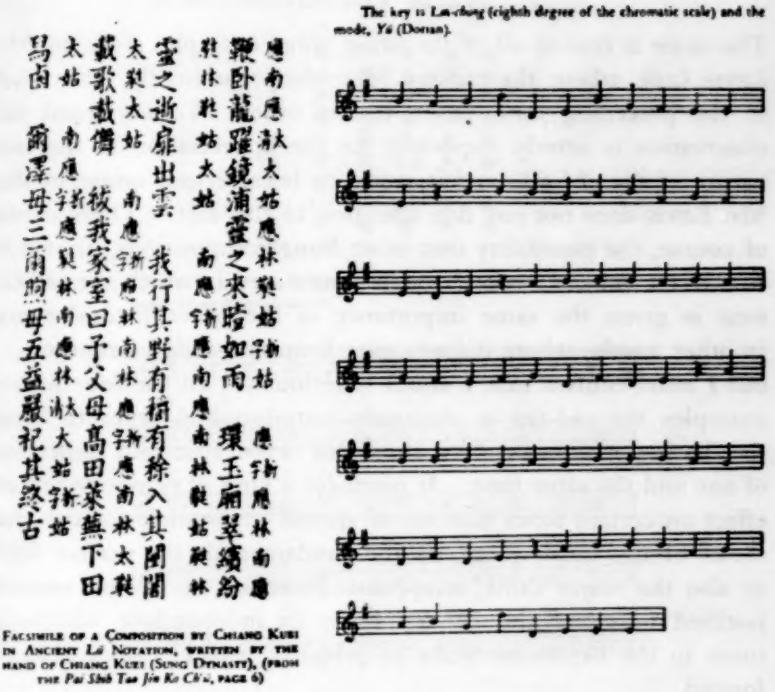



Diagram N° 5.

Here the larger notes represent the main tones of the scale, the smaller ones, auxiliary tones of lesser importance, and the diamond-shaped notes, the fractional notes or *chê-tzŭ* which sound a little higher than indicated by their position relative to the lines.

(19*a*) Only the Arabic *mathal* theory (see footnote 4) could, with some restrictions, be quoted as a parallel to CHIANG K'UEI's innovation.

(20) From LEVIS, *op. cit.*, p. 75.

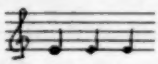
As an illustration of this unique system, a facsimile of one of CHIANG K'UEI's compositions, together with Mr. LEVIS' transcription into modern notes, is given below (21). There the smaller characters of the first, third, fifth, and seventh columns (from right to left) accompanying the text of the poem (which is written in larger characters in the colums of even order), represent the musical notation of CHIANG K'UEI's composition.

FACSIMILE OF A COMPOSITION BY CHIANG KUEI IN ANCIENT *Lü* NOTATION, WRITTEN BY THE HAND OF CHIANG KUEI (SUNG DYNASTY), (FROM THE *Pai Shih Tao Jên Ko Ch'u*, PAGE 6)

In this notation, the first syllables of the names of the twelve *lüs* are used (cf. p. 78); they indicate the absolute pitch of each tone, not only, as do the syllables of the ancient notation : *kung*, *shang*, *chiao*, *etc.*, relative tone intervals.

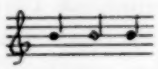
The *chê-tzŭ* note appears seven times : column 1, 11th and 14th characters; column 3, 9th; column 5, 7th and 13th; column 7, 5th

(21) " Music-poemVI. " From LEVIS, *op. cit.*, p. 174-75, from the *Pai Shih Tao Jên Ko Ch'u*, 8556, 9964, 10780, 5624, 6046, 3062), p. 6.

and 15th. In each case, it stands *between two notes of the same pitch*, the sequences here being either : *ku*, *chê-tzŭ*, *ku*



or : *ying*, *chê-tzŭ*, *ying*



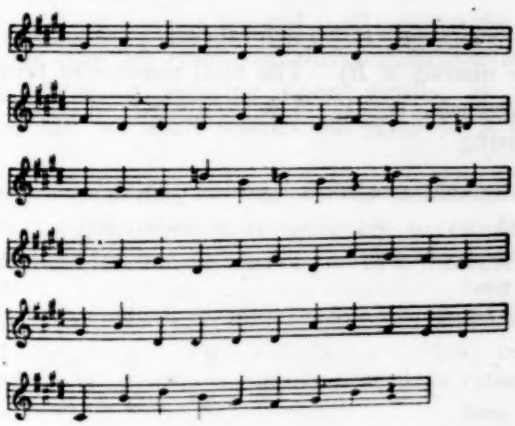
The same is true of all of the other three examples given by Mr. LEVIS (22), where the *chê-tzŭ* tone also consistently leads back to the preceding tone, never to any other. To my mind this observation is utterly important for the appreciation of the true nature of the *chê-tzŭ*, and it seems to be a serious omission that Mr. LEVIS does not pay due attention to this fact. There exists, of course, the possibility that other Sung compositions, known to Mr. LEVIS but unknown to me, are preserved in which the *chê-tzŭ* tone is given the same importance as the other natural tones, in other words, where it leads over from one tone to another, — but I must confess that I doubt it seriously. In the four named examples the *chê-tzŭ* is obviously introduced in order to break the boring monotony of a three- or even four-fold repetition of one and the same tone. It produces a kind of primitive *vibrato* effect on certain tones that are of special importance for the character of the music-piece, as the fundamental, the perfect fifth, or also the major third; it appears, therefore, to be not entirely justified to count the *chê-tzŭ* tones as independent additional tones to the heptatonic scale by which a true nine-tone scale is formed.

From the fact that the *chê-tzŭ* is found, in three out of four examples (A, B, and D of diagram no. 5), to stand together with the fundamental or the perfect fifth, or both, Mr. LEVIS derives the theory that the *chê-tzŭ* tones correspond to the 13th and 14th degrees of the circle of natural fifths, which would mean that the difference in pitch can be defined by the ditonic comma. The weakness of this theory is evident. As Mr. LEVIS admits

(22) From LEVIS, *op. cit.* pp. 176-78, from the *Pai Shih Tao Jên Ko Ch'u.*, pp. 6 and 7; one of them is reproduced in facsimile on p. 87.

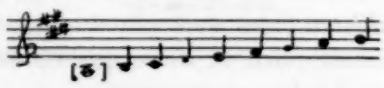
himself, it does not yield a satisfactory explanation for the fact that in one example (D) the *chê-tzŭ* appears with the fundamental and the major third, not the perfect fifth. There can hardly be a doubt that it was not for theoretical but for purely aesthetical reasons that the *chê-tzŭ* tones were introduced, and the discussion of the probable exact pitch of those queer tones would appear to be of no practical value whatsoever.

Pai Shih Tao Jên Ko Ch'ü, page 7. Ancient Chinese *lü* notation.

The key is *Nan-lü* (tenth degree of the chromatic scale) and the mode, *Shang* (Mixo-Lydian).

5. However, it is not only the *chê-tzŭ* tones that make Sung music more interesting and fascinating than that of the other periods of Chinese history altogether. Let us, before leaving this question, have a look at the third of Mr. LEVIS' four Sung music-poems (23) rendered above in facsimile and transcription.

(23) "Music-poem VIII", p. 177.

The key is *nan-lü* (*A*), the mode, *shang tiao* (Mixo-Lydian), it is asserted at the end of the piece, according to Mr. LEVIS. Thus the basic scale of our composition ought to run :



the smaller notes ($D\sharp$ and $G\sharp$) indicating the "auxiliary or passing tones of lesser importance" in the ordinary Mixo-Lydian mode (cf. diagram no. 4). But evidently, the scale here in use is not the pure Mixo-Lydian (*shang tiao*) because it employs in several instances $D\natural$ instead of the scale tone $D\sharp$, not to speak of the *D♯-chê-tzŭ*. And this irregularity is not the only one. A brief statistical analysis will perhaps be useful.

The complete scale of the piece employs the following tones :

it corresponds to type "C" of diagram no. 5 (in which *C* is chosen ground tone instead of *B*). The total number of tones of which the piece consists, is 62. The frequency of their occurrence is the following :

B (ground tone, chief tone of the heptatonic scale) . . .	7	times
$C\sharp$ (chief tone)	1	»
$D\natural$ (tone foreign to the scale)	4	»
$D\sharp$ (auxiliary tone)	14	»
D♯-chê-tzŭ	2	»
E (chief tone)	3	»
$F\sharp$ (chief tone)	12	»
$G\sharp$ (auxiliary tone)	14	»
A (chief tone)	5	»
TOTAL	62	»

The first thing to be observed is, that the total number of the chief tones of the ancient heptatonic scale (which form the basic pentatonic scale, *B*, $C\sharp$, *E*, $F\sharp$, *A*) amounts only to 28, which is less than one-half of the number of tones of the whole piece. The two "auxiliary" or "passing" tones, $D\sharp$ and $G\sharp$, occur 14 times

each. Thus the two auxiliary tones alone keep the balance against the five chief tones, which means that the ancient scale system is set completely upside-down, the auxiliary tones having a marked prevalence over the chief tones. This together with the occurrence of the foreign tone *D*♯ shows with sufficient strength that there is but little reason for calling the scale "Mixo-Lydian" (24). In reality, the composer of this music-poem has entirely broken the narrow frame of the ancient musical laws, and he clearly aims at creating a new style which, perhaps, we may call "chromatic".

We really must regret that this fascinating new creation was never continued but was condemned to fall into complete oblivion during the following centuries.

6. As concerns the rhythmical structure of Chinese music-pieces, it is a matter of fact that the Chinese lay a considerably lesser stress on this component than on that of melody. This is also evident from the fact that the notation of time values stands on a much lower level than that of melodic movement. In many musical scores, rhythm is not denoted at all (25); on the other hand, when rhythmic signs are employed, their significance is not always unequivocal. Without entering upon details, as this would carry us too far, we shall restrict ourselves to a few general statements.

Anything corresponding to our ***bar*** is unknown in Chinese musical scores. Therefore it is necessary to employ different rhythmic symbols for the different beats of a measure or musical phrase. The time which is most commonly used is $\frac{4}{4}$; next after it comes $\frac{2}{4}$. $\frac{3}{4}$ or $\frac{6}{4}$ time is nowadays rather unusual,

(24) LEVIS, in his discussion of these compositions, (p. 173) goes only half-way, when he says : "The actual tonality of the music agrees with that in which it is claimed to have been written. Several of these songs are not written upon a five tone basis but more truly upon a seven tone basis. This becomes evident not only through the effect upon the ear but also by observing the relative frequency of the different tones in each piece".

(25) A rhythmic notation is, of course, not yet to be found in the scores by CHIANG K'UEI. The first man to discuss the various kinds of rhythm in music was CHANG YEN (416, 13069) of the late Sung era (born, 1248). Later, the composer Wei Liang-fu (12567, 7017, 3627), about the year 1530, wrote on the subject.

though they seem to have been much more frequently employed during the T'ang and Sung eras. This is true particularly of popular music; in artistical compositions, all kinds of time are met with, such as $\frac{6}{4}$, $\frac{4\frac{1}{2}}{4}$, $\frac{5}{4}$, $\frac{7\frac{1}{2}}{4}$, etc.

The common principle of all classes of rhythmical notation may be expressed as follows : supposing, for the sake of simplicity, that a music-piece be written in $\frac{4}{4}$ time, then

1 rhythmic symbol standing with 1 note indicates 1 beat, or 1 crotchet;
1 rhythmic symbol standing with 2 notes indicates $\frac{2}{2}$ beats, or 2 quavers;
1 rhythmic symbol standing with 4 notes indicates $\frac{4}{4}$ beats, or 4 semi-quavers;
2 rhythmic symbols standing with 1 note indicate 2 beats, or 1 minim;
3 rhythmic symbols standing with 1 note indicate 3 beats, or 1 dotted minim;
4 rhythmic symbols standing with 1 note indicate 4 beats, or 1 semi-breve.

1 rhythmic symbol standing with 3 notes may indicate either 1 quaver triplet, or 1 quaver followed by 2 semiquavers, or 2 semiquavers followed by 1 quaver. It is in every case left to the personal taste of the musician or singer to choose between these three possibilities.

The following diagram no. 6 (26) will serve as an illustration of the above statements.

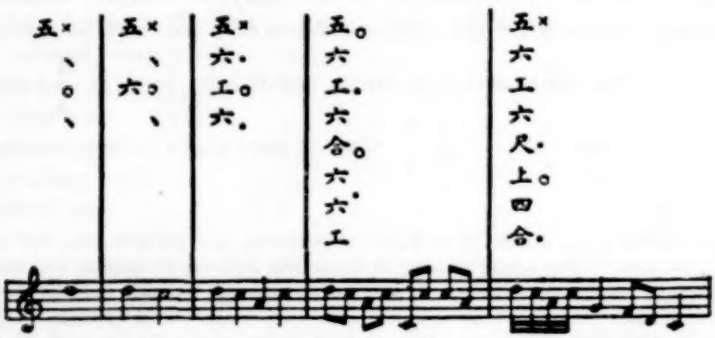



Diagram N° 6.

(26) Reproduced from LEVIS, *op. cit.*, p. 96.

For further information, the reader is referred to the discussion of the subject in LEVIS' work, pp. 94-96, and to an article by WANG GUANG KI, *Über die chinesischen Notenschriften* (27).

7. The foregoing paragraphs were mainly devoted to the discussions of the general principles governing Chinese musical art. They are applicable to instrumental as well as vocal music. In the following, we shall have to occupy ourselves with the special problem of the laws of vocal composition. As a matter of fact, this stands in the focus of interest, and it is entirely justified that by far the greater part of Mr. LEVIS' work treats of this subject.

One of the most striking features of the Chinese language are the so-called "tones" (shêng, 9883) by which, even in ordinary speech, a decidedly musical effect is produced. Of course, there are also other languages than the Chinese and those related to it, in which a characteristical word (not only phrase) intonation is met with, as for instance Norwegian, Swedish, Lithuanian, or Croatian. But in the latter the different intonation serves only in exceptional cases as a means of distinguishing between the two words which for the rest are identical in pronounciation [thus, in Norwegian *seter* (plural of *sete*, "seat") is pronounced with a compound (falling and then rising) intonation, but *seter*, "dairy cottage", with a simple rising intonation], while in Chinese this forms the rule. There can, however, hardly be a doubt that also the Indo-European languages once possessed a melodic movement or intonation inherent in the pronunciation of every word. The accents introduced by the Alexandrian grammarians into written Greek certainly indicate melodic, and also rhythmic movement; and a similar function must be attributed to the accents which are found, in Sanskrit, in the Vedic Chant (*udātta*, acute, *an-udātta*, grave, *svarita*, circumflex). As to the mediaeval Byzantine and Latin *neumes*, it must be remembered that the Byzantine neume notation, although in some way connected with the Greek accents, has not been directly developed from these. This is evident from the earliest preserved texts in which the neume notation always appears *together* with the accents, but

(27) Published in *Sinica*, Vol. III (1928), pp. 110-23 (in the preceding volume of *Sinica*, the same author's name is spelled "WANG KUANG KI", cf. footnote (6*a*)).

without a consistent congruence between the two; thus, for instance, the acute accent is not necessarily coupled with a rising melodic movement, nor the grave with a falling (28).

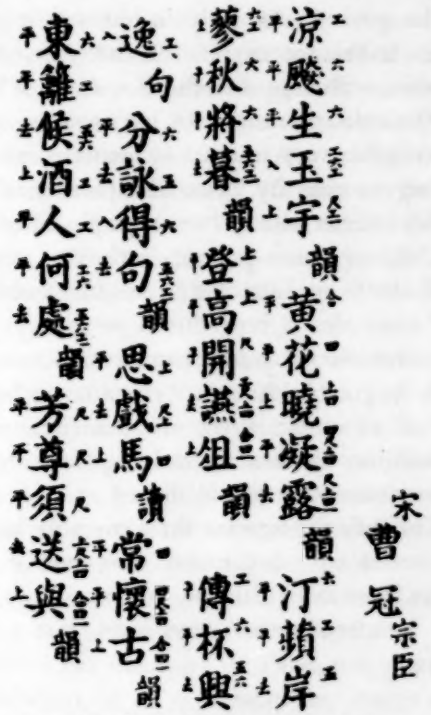
Mr. LEVIS, in his discussion of the matter, is clearly aware of this. If he is quoting the European neumes at all in his book he does it for the reason that they play a rôle which is strikingly similar to that of the "tones" in Chinese music. He therefore also suggests to abolish the equivocal and inadequate term "tone ", and to substitute for it the expression "neume". Both in China and in the West, there are three well defined elements of melodic movement : level, rising, and falling, and in both parts of the world these elements were used, intentionally or unconsciously, as the basis of melody in music. The whole Chapter V of Mr. LEVIS' work is devoted to the parallelism between the neumes of China and Europe; it shows clearly that the similarity is not only a superficial one. Here we can of course only consider the part played by the neumes in Chinese music.

The first man to classify the four neumes, was SHÊN YÜEH 9849, 13791) (A. D. 441-513). It is reported that, when asked by the Emperor T'AI WU TI (10573, 12744, 10942) about the nature of these neumes, he answered with a bon-mot : "They are *T'ien-tzŭ shêng chê* (29) (11208, 12317, 9892, 553), "The Son of Heaven is learned and wise", the four words consecutively illustrating the four neumes : *t'ien* (*p'ing shêng*, 1st neume), *tzŭ* (*shang shêng*, 2nd neume), *shêng* (*ch'ü shêng*, 3rd neume), *chê* (*ju shêng*, 4th neume). The discovery (of course not "invention") of these four neumes was certainly an excellent achievement, and due credit has been given for it to SHÊN YÜEH by the historians. But citing LEVIS literally, "the true greatness of SHÊN YÜEH lies in this, that he was the first to recognize, use and institute the neumes as the basis of musical composition in conjunction with poetry". If, possibly or even probably, before the time of SHÊN YÜEH, the melodic movement of songs was unconsciously formed according to the neumes of the words to be sung, this became through him the governing principle of composition for all times to come, and no composition could henceforth be called perfect if these

(28) Cf. HUGO RIEMANN, *Musik-Lexikon*, s.v. "Byzantinische Musik".
(29) LEVIS transliterates "chih" instead of "chê".

rules were neglected. Thus SHÊN YÜEH's name stands at the beginning of the vocal musical art in China.

In analyzing musical compositions, LEVIS distinguishes between the *immaterial* and the *material* form, the former of which he terms "structure", the latter, "tonal superstructure". The structure of a music-poem is defined by the neumes of the words



FACSIMILE OF CHINESE SCORE WITH DUAL NOTATION (MOVEMENT AND SCALE) AND WORDS

of which it consists; it indicates the direction in which the melody has to move : where it has to poise, where to rise, where to fall. All that is left to the composer, is to invent an artistically satisfactory melody, to find a tonal superstructure which obeys the general laws of movement inherent in the structure of the poem. Thus the Chinese composer of a poem has considerably less freedom of invention than his European colleague.

The Chinese theoreticians divide the neumes into two groups : the first, *p'ing* (9310), "level" group, is made up of the *p'ing*

shêng only, the second, *tsê* (11682), "oblique" group, comprises the *shang* (9729), *ch'ü* (3068) and *ju* (5690) *shêng*. The *p'ing* group, because poising, motionless, is considered negative, *yin*, the *tsê* group, because moving upwards or downwards, positive, *yang*. In the spoken language, the *ju shêng* sounds utterly short; therefore, in song, it is usually replaced by one of the other three neumes, not only those of its own group but also by the *p'ing shêng*. In poetry (not only in music), it is important to keep as perfect a balance as possible between the positive and negative elements, with regard to the frequency of their occurrence as well as to their distribution. In his analyses of music-poems, Mr. LEVIS makes the very interesting experiments to mark down the *yin* and *yang* neumes by white and black circles respectively; he thus obtains patterns which show a simply surprising regularity.

In many Chinese music-poems, both the structure and the tonal superstructure are denoted. As an illustration, the first of Mr. LEVIS' examples is reproduced on p. 93 (30).

The congruence between the neume structure and the tonal superstructure is good although it is not perfect. The entire piece consists of 48 units; in six of them (i.e. one-eighth of the whole), the melodic movement violates the rule prescribed by the neume structure — horribile dictu !

But no ! This offence against the venerable law of olden time shall fill our hearts with joy rather than horror : it shows that music in China, just as in Europe, is not a mere handicraft constrained by a hundred eternal iron laws, but a living and ever rejuvenescent art.

WILLY HARTNER

(30) *Op. cit.*, p. 104 [Music-poem I, untitled, text by TS'AO KUAN (11636, 6373) of the Sung era, composed by HSIEH YÜAN-HUAI (4432, 13744, 5034) in 1848]. The same music-poem was analyzed, from another point of view, in an interesting article by HEINZ TREFZGER ("Die Musik in China", in *Sinica*, XI (1936), pp. 171-97).

Le Primitif et le Savant

Dans le compte rendu qu'il a consacré ici-même (1) au très savant mémoire de M. ARMAND DELATTE : « *Herbarius. Recherches sur le cérémonial usité chez les Anciens pour la cueillette des simples et des herbes magiques* » (2), M. CONWAY ZIRKLE, évoquant les conditions qui, croyait-on, devaient être remplies pour qu'on pût procéder à la cueillette, écrivait : "It may not be amiss to raise the question as to how long some of these ancient beliefs persisted in higher circles. The sixteenth century Herbals certainly contain some odd remedies and old editions of the Pharmacopoeia make appalling reading" (3).

Nous avons eu, à différentes reprises (4), l'occasion de suggérer, notamment dans cette revue, qu' « il n'y a pas de solution de continuité entre la pensée du primitif et celle du savant d'une époque relativement rapprochée. Ce serait un jeu aisé, pensons-nous, de substituer aux primitifs des profonds ouvrages de M. LUCIEN LÉVY-BRUHL, un CARDAN... ou un VAN HELMONT... » (5); les plus anciens volumes du *Journal des Savants* et des *Philosophical Transactions* pourraient aussi, à cet égard, être consultés avec fruit, et un cours d'histoire des sciences et de la pensée scientifique ne devra pas manquer de s'assigner, comme un de ses buts essentiels, le récit de ce qui constitue, moins peut-être une évolution intellectuelle, un progrès de l'intelligence, qu'une

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(1) *Isis*, vol. 27, no. 75, nov. 1937, pp. 531-2.

(2) *Acad. royale de Belgique, Bull. de la Cl. des Lettres*, 5e série, t. 22, 1936; pp. 227-348.

(3) *Isis*, loc. cit., p. 532.

(4) *Isis*, vol. 20, no. 59, janvier 1934, p. 469 et vol. 25, no. 70, septembre 1936, p. 468; *Archeion*, vol. 16, no. 2, avril-juin 1934, pp. 186-204 : « Le folklore et l'histoire de la pensée scientifique »; *XVIe Congrès International d'Anthropologie et d'Archéologie Préhistorique*, 1 vol., Bruxelles, 1936, pp. 993-997 et LXII : « Questionnaire de folklore pour servir à l'histoire de la pensée scientifique ».

(5) *Isis*, vol. 27, no. 74, août 1937, p. 335.

libération progressive de l'esprit. En somme, on ne croit plus aujourd'hui aux primitifs.

Un exemple frappant à l'appui de notre thèse nous a été fourni récemment par un passage d'une lettre inédite du chimiste et pomologiste JEAN-BAPTISTE VAN MONS (1765-1842), professeur à l'Université de Louvain, associé non résidant de la I[ère] Classe de l'Institut national de France (1796), membre de l'Académie royale des Sciences et Belles-Lettres de Bruxelles (1816) (6). Ce document, qui appartient à la collection des quelque 1.500 lettres du fonds Stas de l'Université libre de Bruxelles (7), date du séjour de STAS au laboratoire de DUMAS à Paris (de fin 1837 à fin 1840 ou début 1841), et, comme les autres lettres adressées par VAN MONS à STAS, a un caractère très technique. On y lit :

« Je vais vous faire une question. Qui de vous veut extraire de l'ether de pommes mortes de gangrene seche ? pourries et restées seches. Pour s'eteindre ainsi dans leur vitalité secondaire, leur survie, elles doivent avoir eté cueillies au decroît de la lune (8). En ouvrant de telles pommes pour en retirer les pepins on est frappé de la forte odeur de liqueur anodine qui se repand. Toute la maison a la question quelle etait cette odeur a repondu : celle des gouttes d'Hoffman » (9).

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(6) Sur VAN MONS, voir notamment les notices par A. QUETELET. *Annuaire de l'Académie royale de Bruxelles*, 9[e] année, 1843, pp. 177-225, et par VICTOR JACQUES. *Biogr. nat. publiée par l'Acad. r. de Belg.*, t. XV, 1899, col. 120-132.

(7) J. PELSENEER : "Catalogue sommaire des manuscrits du fonds Stas de l'Université libre de Bruxelles" *(Bulletin de la Société chimique de Belgique*, t. 46, nos. 8-9, août-septembre 1937, pp. 367-376).

(8) Cf. A. DELATTE, *loc. cit.*, pp. 239 sq.

(9) Au fur et à mesure que l'on remonte dans le temps, les documents tels que celui-ci se font évidemment plus nombreux et plus significatifs; voici un exemple relatif au XVIII[eme] siècle : "... en 1728 les candidats à la licence à Harvard discutaient encore sur le thème suivant : "Les herbes médicinales tiennent-elles leur pouvoir des planètes ?" (BERNARD FAŸ. BENJAMIN FRANKLIN. t. I, Paris, 1929, p. 191 et t. III, Paris, 1931, p. 39). Au XVII[eme] siècle, le savant se meut couramment en pleine pensée primitive; voir par exemple la lettre de juin 1630 et celle du 26 septembre 1630, adressées par VAN HELMONT à MERSENNE (*Correspondance du P. Marin Mersenne*, religieux Minime, publiée par M[me] PAUL TANNERY, éditée et annotée par CORNELIS DE WAARD. t. II, Paris, 1937; pp. 496 sq. et 530 sq.; n.b. les commentaires de ces lettres). Mais, de nos jours, l'œuvre de certains savants tels que Sir JAGADIS CHUNDER BOSE (1858-1937), n'appartient-elle pas, par plus d'un côté, à la pensée primitive ?

En manière de conclusion, nous demanderons si ce texte ne devrait pas, en bonne logique, se voir assigner une place dans l'histoire d'un courant de pensée dont l'*Herbarius* de M. DELATTE nous raconte un aspect ?

Bruxelles. JEAN PELSENEER.

Notes and Correspondence

Query no. 74. — The mysterious arctic traveller of 1360, Nicholas of Lynn?

In HAKLUYT's *Principal navigations voyages traffiques and discoveries of the English nation* (first printed 1 vol. London 1589; 2nd ed., revised and enlarged, 3 vols., London 1598, 1599, 1600) occur the two following accounts concerning NICHOLAS OF LYNN. My quotations are taken from the Hakluyt Society exact reprint of the second edition (vol. 1, 301-4, Glasgow 1903). The reference to the second edition itself is vol. 1, 122, 1598.

"The voyage of NICHOLAS DE LYNNA a Franciscan Frier, and an excellent Mathematician of Oxford, to all the Regions situate under the North pole, in the yeere 1360, and in the raigne of EDWARD the 3. king of England."

(I omit the Latin text, giving only HAKLUYT's English version of it).

"Touching the description of the North partes, I have taken the same out of the voyage of JAMES CNOYEN of Hartzevan Buske, which alleageth certaine conquests of ARTHUR king of Britaine : and the most part, and chiefest things among the rest, he learned of a certaine priest in the king of Norwayes court, in the yeere 1364. This priest was descended from them which king ARTHUR had sent to inhabite these Islands, and he reported that in the yeere 1360, a certaine English Frier, a Franciscan, and a Mathematician of Oxford, came into those Islands, who leaving them, and passing further by his Magicall Arte, described all those places that he sawe, and tooke the height of them with his Astrolabe, according to the forme that I (GERARD MERCATOR) have set downe in my mappe, and as I have taken it out of the aforesaid JAMES CNOYEN. Hee sayd that those foure Indraughts were drawne into an inward gulfe or whirlepoole, with so great a force, that the ships which once entred therein, could by no meanes be driven backe againe, and that there is never in those parts so much winde blowing, as might be sufficient to drive a Corne mill... "

"A Testimonie of the learned Mathematician master JOHN DEE, touching the foresaid voyage of NICHOLAS DE LINNA. Anno 1360, (that is to wit, in the 3-4 yeere of the reigne of the triumphant king EDWARD the third), a frier of Oxford, being a good Astronomer, went in companie

with others to the most Northern Islands of the world, and there leaving his company together, hee travailed alone, and purposely described all the Northerne Islands, with the indrawing seas : and the record thereof at his returne he delivered to the king of England. The name of which booke is *Inventio Fortunata* (*aliter fortunae*) *qui liber incipit a gradu* 54. *usque ad polum*. Which frier for sundry purposes after that did five times passe from England thither, and home againe.

" It is to be noted, that from the haven of Linne in Norfolke (whereof the foresaid Franciscan frier tooke his name) to Island, it is not above a fortnights sailing with an ordinarie winde, and hath bene of many yeeres a very common and usuall trade : which further appeareth by the privileges granted to the Fishermen of the towne of Blacknie in the said Countie of Norfolke, by king EDWARD the third, for their exemption and freedome from his ordinary service, in respect of their trade to Island."

One wonders on what authority HAKLUYT identified that unknown English Franciscan with NICHOLAS OF LYNN? Neither GERARD MERCATOR (1512-94) nor JOHN DEE (1527-1608) mentioned him by name. The only contemporary NICHOLAS OF LYNN whom I know of was an English Carmelite, who taught theology in Oxford and in 1386 compiled for JOHN OF GAUNT, Duke of Lancaster, a calendar adjusted to the position of Oxford for the years 1386-1462. See A. G. LITTLE's note in DNB (40, 418, 1894). DEE suggested that the unnamed Franciscan was perhaps one HUGH OF IRELAND. Of course he may also have been an unknown NICHOLAS OF LYNN, Franciscan, different from his townsman and contemporary, NICHOLAS OF LYNN, Carmelite.

The text of the *Inventio fortunata qui liber incipit a gradu* 54. *usque ad polum* is apparently lost, but its reality, as well as that of the voyage itself, is plausible. In vol. 2 of his book *In northern mists. Arctic exploration in early times* (London 1911), FRIDTJOF NANSEN referred to it many times, considering it a possible source of the information concerning arctic regions, whose tradition may be detected later on in the works of CLAUDIUS CLAVUS (d. after 1424) and MARTIN BEHAIM (d. 1507). Are there no other traces of that mediaeval tradition in Scandinavian archives? And is there no hope of finding the *Inventio fortunata*? I am writing this note to draw the attention of archivists and keepers of MSS to that mysterious Franciscan who explored the Arctic regions c. 1360 and returned five times "thither and home againe".

Christmas eve, 1937. GEORGE SARTON.

Query no. 75. — Rafaele Canacci, Florentine algebraist of the fourteenth century.

GUILLAUME LIBRI in his *Histoire des sciences mathématiques en Italie*

(vol. 2, 208, Paris 1838) — that book which is so often tantalizing if not exasperating — speaks of one RAFAELE CANACCI, as follows :

"RAPHAËL CANACCI, de Florence qui, au quatorzième siècle, écrivit en italien un traité d'algèbre où se trouvent des renseignements très curieux sur l'histoire des mathématiques, et où sont résolues des questions assez difficiles. Cet ouvrage, qui se conserve encore manuscrit à la bibliothèque Palatine de Florence, mériterait d'être publié. CANACCI, au reste, n'est pas sorti de l'école de FIBONACCI, il parait avoir puisé surtout dans les écrits d'un ancien géomètre, appelé GUILLAUME DE LUNIS, dont GHALIGAI aussi nous a conservé le souvenir."

WILLIAM OF LUNIS is not very tangible himself; he flourished in Naples in the thirteenth century and translated an Arabic algebra (not AL-KWĀRIZMI's) into Latin (see my *Introd.* 2, 563). As to GHALIGAI, that is the Florentine FRANCESCO GHALIGAI who wrote the *Summa de arithmetica* (Florence 1521, often reprinted) and died in 1536. See P RICCARDI : *Biblioteca matematica italiana* (p. 499-502, 1887); D. E. SMITH : *Rara arithmetica* (132, 1908).

LIBRI's vague statement has been repeated by CANTOR in his *Vorlesungen* (vol. ii², 165, 1899) and by GINO LORIA in his *Storia delle matematiche* (vol. 1, 406, Torino 1929), without any material edition.

The examination of CANACCI's Ms. treatise is highly desirable. We would like to know its contents, and to obtain some information about the author.

GEORGE SARTON.

Un "colossal" anachronisme de Freind. — (A propos de l'article de Mr. PHILIP SHORR, *Isis* vol. 27, 453-74, 1937).

On peut lire dans la traduction française de l'*Histoire de la médecine depuis Galien jusqu'au XVI^e siècle de* J. FREIND, Paris, 1728, p. 221 : "CHARLEMAGNE avait deux médecins juifs auprès de lui : FARRAGUTHUS et BUHAHYLILA BENGESLA qui a composé par son ordre le livre appelé *Tacuin* ou les tables de santé, qui sont les mêmes ou fort approchantes que celles qui y sont imprimées sous le nom d'ELLUCHASEM ELIMITHAR". Et en note : "Egass. Bulaei, *Histor. Antiq. Universit. Paris.*, I, 573."

Evidemment, FREIND était mal venu de reprocher à DANIEL LE CLERC, comme le fait observer Mr. SHORR, p. 458, ses anachronismes, car celui- ou plutôt ceux-là, puisqu'il y en a deux réunis, sont de belle taille.

1. BUHAHYLILA BENGESLA est, comme on sait, l'altération par les traducteurs, les copistes et les imprimeurs, du nom d'ABŪ 'ALĪ (YAḤYĀ B. 'ISĀ) BEN JAZLA, médecin de Bagdad de la seconde moitié du XI^e siècle de J.C., chrétien converti à l'islam (cf. G. SARTON, *Introd.*, I, 772). Il est l'auteur du *Taqwīm al-abdān*, traité disposé en tableaux synoptiques,

qui fut traduit en latin puis imprimé et réuni à un ouvrage de présentation analogue : le *Taqwīm as-ṣiḥḥa* d'IBN BUṬLĀN (dº, I, 730). Le nom et la *kunya* de ce dernier : ABU 'L-ḤASAN AL-MUKHTĀR, sont devenus sous la plume des copistes : ELLUCHASEM ELIMITHAR. IBN BUṬLĀN est également un médecin de Bagdad, demeuré chrétien, de la première moitié du même XIe siècle. Ce sont ses controverses médico-philosophiques avec IBN RIḌWĀN du Caire que viennent de publier M. M. SCHACHT et MEYERHOF.

2. FARRAGUTHUS est le nom latinisé d'un célèbre traducteur juif du XIIIe siècle : FARAJ BEN SĀLIM, qui travailla à la cour de CHARLES D'ANJOU — d'ou la confusion avec CHARLEMAGNE. On lui doit précisément la version latine du *Taqwīm al-abdān* et on pense qu'il traduisit aussi le *Taqwīm as-ṣiḥḥa*.

Tout cela est résumé dans *l'Histoire de la médecine arabe* de LUCIEN LECLERC (II, 464 et 500). Il y avait là pour Mr. PH. SHORR un bel exemple qui eut illustré sa démonstration, encore que FREIND n'ait pas été le seul à commettre cette retentissante bévue.

(*Rabat.*) H. P. J. RENAUD.

George Catlin, " Indian-loving Catlin " (1796-1872).—A footnote to SARTON's article on him (*Isis* 22, 77-89, 4 fig., 1934). In the " Autobiography, memory and experiences of MONCURE DANIEL CONWAY" (1832-1907), the account of a generous life published in London 1904, I find (vol. 2, 194) the following item concerning CATLIN's curious medical ideas. It was suggested to CONWAY's mind by the unfortunate publication by FROUDE of CARLYLE's *Reminiscences* (London 1881).

" The burden of correcting two of the most serious errors in the biography fell on me. It was the most grievous burden of my literary life, but laid on me by every consideration of honour. One of them involved both CARLYLE and his wife. FROUDE and I were once passing an evening with them, when I told CARLYLE of a visit I had made at Ostend to GEORGE CATLIN, the American artist, who had lived among the aborigines in the West, and made pictures of them. CARLYLE then told us of an early pamphlet by CATLIN entitled, ' Shut Your Mouth ! '. In it CATLIN related that the Mandan Indians believed that diseases entered by the mouth, and that the squaws took care to close the mouths of their sleeping children, who consequently never had measles, scarlatina, etc. CATLIN adopted this theory, and CARLYLE said he read his brochure with interest. Then Mrs. CARLYLE told us a merry story. Once, when more ill than usual, she hid it from CARLYLE, whose work was very hard. One evening, just after tea, CARLYLE began to read, and she lay on the sofa gasping, when he turned and said, ' Hadn't you better shut your mouth ? ' She said she felt like throwing the teacup at him.

It turned out, however, that CARLYLE had perceived the trouble she was trying to conceal, and in his anxiety it had occurred to him that CATLIN's prescription—'Keep your mouth shut!'—might help her. FROUDE forgot the essential part of the story, said nothing about CATLIN and his book, and instead of the narrative by which Mrs. CARLYLE told of her husband's anxiety for her, made it an example of his rudeness in bidding her shut her mouth. As I was the only witness who could tell the true incident, I felt bound to do so. CARLYLE was never rude to his wife. Even if she made a provoking remark he took it meekly. When CARLYLE stormed about anything it was about some large question; he was gentle and submissive in simply personal matters."

G. S.

Editorial board of Isis. — I have the great pleasure of reporting the addition to our board of two scholars, who will help me direct two important departments thus far unrepresented. Dr. DANA B. DURAND will take charge of the *Renaissance*, and Dr. ROBERT K. MERTON, of the *Social aspects of science*.

Dr. DANA B. DURAND was born in Washington, D. C. in 1904. S. B. Harvard 1925, and Ph. D. Harvard 1935. Two Sheldon travelling fellowships from Harvard for study in Europe (1926 and 1931). Since 1930 instructor and tutor in History and Literature at Harvard, specializing in the Renaissance. Since 1931, he has been working in the history of science, especially geography during the 15th century. He has published various articles, and hopes to publish in 1938 a book on the origins of modern scientific cartography in the 15th century. In 1937, he gave a half course in the history of science during the later Middle Ages and the Renaissance, the first of its kind to be given at Harvard.

He is well known to the readers of *Isis* because of his paper on *The earliest modern maps of Germany and Central Europe* (vol. 19, 486-502, 3 pl., 1933) and many reviews. His address is care of Harvard University, Cambridge, Mass., or South Lincoln, Mass.

Dr. ROBERT K. MERTON was born in Philadelphia, Pennsylvania, in 1910. He received the degree of B. A. at Temple University and the degrees of A. M. and Ph. D. in the field of sociology at Harvard University. At present, he is an instructor and secretary of the Board of Tutors in the Division of Sociology at Harvard. His articles on the social aspects of science and technology have appeared in English, American and Italian journals. He is now engaged in a study of the social controls over science in liberal and totalitarian societies.

He is already known to the readers of *Isis* because of his papers on *The course of Arabian intellectual development*, 700-1300 *A.D.* A study

in method, written with Professor PITIRIM A. SOROKIN (vol. 22, 516-24, 1935) and on *The sociology of knowledge* (vol. 27, 493-503, 1937) and many reviews. He has also published a long memoir on "Science, technology, and society in seventeenth century England" in *Osiris* (vol. IV, 1938). His address is care of Harvard University, Division of Sociology, Cambridge, Mass.

The creation of the new department intrusted to him, "Social aspects of science", requires a few words of explanation. It is often claimed that science is independent of morality, because of its objectivity and absolute disinterestedness. This matter has been beautifully discussed by HENRI POINCARÉ (*Dernières pensées*, p. 223-47, Paris 1913). Whatever the relationships between science (pure science, if there be such a thing) on the one hand, and ethics and politics on the other, it is certain that men of science and learned men are men and citizens. Their moral and social qualities matter a great deal. Moreover, scientific abstractions are derived from experience, they are influenced by the social environment and they help to modify that environment. The political vicissitudes entailed by the Great War and which might so easily entail a new one have given to these questions a burning actuality. Nobody can escape them, and it has become one of the main duties of the historian of science to explain them to the community. I count on Dr. MERTON for performing that essential service in *Isis*.

I look forward to many years of fruitful and friendly cooperation with Dr. DURAND and Dr. MERTON.

GEORGE SARTON.

Personalia. — (*News pertinent to this section should be sent directly to* Mr. L. GUINET, 11 *Place général Meiser, Brussels, Belgium*).

Dr. TENNEY L. DAVIS, Associate Professor of Organic Chemistry at the Massachusetts Institute of Technology, was elected a Corresponding Member of the Bohemian Royal Society of Sciences (Prague) on January 13th, 1937.

On November 24, 1937, Dr. GEORGE SARTON was elected a member of the American Council of the Institute of Pacific Relations, in New York.

Reviews

John K. Shryock.—*The study of human abilities. The Jen wu chih of* Liu Shao. With an introductory study. x+168 p. (American oriental series, 11). New Haven, Connecticut, American Oriental Society, 1937.

This little volume beautifully printed—with regard to the Chinese type as well as to the Western type—is an important addition to our knowledge of ancient Chinese thought. It contains the first western translation of the *Jen wu chih* (Record of individuals ; study of human abilities) written c. 240-50—i. e., soon after the fall of the Eastern Han, during the troubled era of the Three Kingdoms (221-64)—by a retired official named Liu Shao (see my *Introd.*, 1, 321).

The *Jen wu chih* is the only surviving work of its kind of that time and its authenticity is fairly certain. It was first printed in 1565 and at least twelve times more after that (1). However, the text is not very well known, even to Chinese literati, as it is not classed as literature. It is one of those venerable classics which everybody knows but nobody

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(1) 1. 明嘉靖乙丑 (1565) 上海顧定英刊本.
2. 明隆慶壬申 (1572) 鄭星刊本.
3. 明萬歷甲申 (1584) 河間劉用霖刊本.
4. 清乾隆十二年 (1747) 影氏寶璣樓重校刊本.
5. 聚珍倣宋叢書本.
6. 明萬曆刻本. 兩京遺編本.
7. 漢魏叢書本.
8. 守山閣叢書本.
9. 墨海金壺本.
10. 談鋪叢書本.
11. 金臺本校刊.
12. 漢魏明文乘明刊坊行本.
13. 明正德刊本.

reads. Let us hope that this English translation will awaken the curiosity of a new public.

In order to have an idea of its contents let us first turn to the general catalogue of the library of CH'IEN-LUNG (Manchu emperor 1736-96):

"The book discusses chiefly human ability, and tests the abilities that are hidden within, with the manifestations which are shown without. It differentiates the categories and grades, and analyzes the similitudes. Therefore all bibliographies from the Sui history on, classify it under the Logicians. But what he says investigates the reality of things. It is essentially correct, and approximates the law." (p. 29).

Then let us read the author's own preface:

"The sages admired wisdom more than all else. Of all wisdom, there is nothing more valuable than to know men, and those who know men are certainly wise. In this way all the abilities are put in their proper order, so that merit will prosper. Therefore the sages composed the *Book of changes*, to establish the designations of the gentleman and the small man. They wrote the preface to the *Odes* in order to differentiate the elegance and orthodoxy of customs, and instituted ritual and music in order to examine the great and awesome virtues of the Six Arts. They set their faces southward in order to use the abilities of the gentlemen. All these things were for the establishment of the various excellences, and the completion of the work of Heaven. When the work of Heaven has been completed, all will receive their proper classification and praise.

Therefore YAO was commended for his ability to make capable and virtuous men distinguished. SHUN made an achievement by using the sixteen illustrious men. T'ANG secured his reputation by using the worthy man of Yu-hsin. WEN WANG was valued because of his using the old man of Wei-pin.

We may conclude from this, that when the sages established their virtues, they exhausted their wisdom in finding men, and obtained comfort in appointing to office.

Therefore if CHUNG-NI [CONFUCIUS] had not examined his disciples, he could not have improved them. So he divided his disciples into four groups, and differentiated all abilities into three categories. He also commended the doctrine of the mean, in order to distinguish the virtue of the sages. He esteemed virtue in order to urge the statement of approximations. He gave instructions concerning the six defects, in order to warn against the deficiencies of partial abilities. He thought of the ambitious and the conventional in order to bridge over the abilities of the conventional and the ambitious. He hated those who were ignorant but who were without sincerity, in order to show that the similitude is hard to preserve. He also said, 'Examine what gives a man pleasure, and observe whence he comes, in order to know the actions of his ordinary behavior. The investigation of men in the greatest detail is like this. Therefore I dare to follow the teachings of the sage in composing this work, in order to mend my memory. And I wish that widely-learned gentlemen should consider its significance." (p. 3).

The *Jen wu chih* is divided into three books containing respectively four, five and three chapters, that is, twelve chapters altogether.

" Book 1, after laying down the philosophic foundation, and stating the position that all qualities within a man have manifestations which can be observed, deals with these internal characteristics, and the laws which govern them. Book II treats of the work which can be accomplished by each ability, with the advantages and corresponding dangers and limitations which accompany each type of character in its work, with the way to know the different types, with extraordinary men, and with different methods of observation. In other words, Book I deals with what is within a man, while Book II deals with its outward manifestation and the ways of observing it. Book III deals with the mistakes into which one may fall in judging men, the difficulties of obtaining results, and the overcoming of difficulties due to competition. Book I treats of the information to be obtained, Book II, of the way of obtaining it and its use, while Book III safeguards the application of the knowledge. This knowledge is the knowledge of men. The division into books was probably made later than LIU SHAO." (p. 62).

The author gives an elaborate analysis of the work which precedes the text itself and is perhaps a better way of explaining it than by means of a running commentary ; moreover he has added a number of valuable footnotes. The preface quoted above reveals the spirit informing this treatise, wherein we find a strange mixture of shrewd observations together with that most artificial schematization which has always been the Chinese ideal of science (see my remarks on Chinese medicine, *Isis* 14, 259).

LIU SHAO was an extra dry Confucianist. Says the translator : " His mind was thoroughly rational and materialistic. At a time when the old Chinese civilization was decadent, when doubt and distrust of established things were growing, when superstition was almost universal and Buddhism and Taoism were spreading throughout the empire, he remained singularly sane, logical, and free from the defects of his time. He was lenient in an age of cruelty. He was rational in an age of credulity. He gave his life to the preservation of the structure of society in an age when that structure was crumbling. And when he retired from active life, he produced a work which has been of great influence on subsequent generations of his people, and which should be of value in the west as well as in the east." (p. 26). In the typical manner of the Chinese sages he had no patience with superstition, yet the fantastic and arbitrary rationalizations wherein he indulged with more fondness for symmetry than for experiment, what else was that but superstition of a subtler kind ?

Read his own treatise or SHRYOCK's chapter on " The science of LIU SHAO." What was that science ? The *yin* and *yang* dualism, plus the theory of five elements and the classification by fives carried to the limit of absurdity, the power of these elements, etc. SHRYOCK concludes :

" In regard to general method, LIU SHAO is thoroughly scientific. ' If a thing

possesses both form and substance, it is possible to investigate it.' No modern scientist could do better than this. If the scientific theories of the 3rd century have been abandoned in favor of better ones, the methods and assumptions of LIU SHAO can hardly be improved upon. His work consists of accurate generalizations based upon experience. He never gives a non-scientific answer to a scientific question." (p. 38).

Our conclusion is that the translator is as ignorant of science and of scientific methods as LIU SHAO. Our skepticism with regard to the genuineness of his scientific knowledge is confirmed (not assuaged) by his display of irrelevant information on hormones, endocrine glands, etc.

It is better to consider LIU SHAO not as a scientist, which he was not even from the Chinese point of view, but as a Confucian moralist and statesman. The author remarks (p. 4): " The relation between the *Jen wu chih* and the *Analects* may be compared to the relation between a well-arranged treatise on theology and the Gospels. Or it might be said that LIU SHAO has done for the *Analects* what ARISTOTLE did for pre-Socratic Greek thought." This is perhaps a little exaggerated but let it pass. LIU SHAO had perhaps been a member of the Wei ruler's " brain trust " and gave his master ethical advice in the Confucian style. The ruler should be surrounded and guided by disinterested advisers, ministers without definite responsibility, like the Elder Statesmen of Japan or the ministers without portfolio of Europe.

Chapter V containing a " Comparison of the *Jen wu chih* with other literature " is very stimulating. The comparison is not restricted to Chinese literature; it is extended to Japanese, Sanskrit, Egyptian, Arabic, Persian, Turkish,—but that is done without any order and far too superficially. The author does not seem to realize that such a topic—advice to kings—was a commonplace of mediaeval literature. There are a great many such treatises not simply in Arabic and other oriental languages but also in Latin, French and other vernaculars. I have quoted many such texts, Arabic, Hebrew, Latin, etc. in my *Introduction*. See for instance in the index of vol. II, *De instructione principum*, *Oculus pastoralis*, *Liber erudiens futurum rectorem populorum*. *Regimen principum*, *Eruditio regum*, etc., or read the summaries of each century concerned with law and sociology. It would be worth while to compare these innumerable texts. I imagine that ARISTOTLE is the *fons et origo* of most of them, that is, of the Greco-Arabic-European ones. The Chinese text is extremely different, and thus its publication in English is very welcome.

Dr. SHRYOCK did me the honor of using my *Introduction* and even of referring to it, but it was not quite fair to draw attention to the incorrect statement on p. 315, and not to the more elaborate one on p. 321.

Moreover he should not have used my *Introduction* for Chinese matters only, about which my knowledge is unavoidably superficial and incomplete, but rather for western matters. My work would have enabled him to make a better comparison between Chinese and Western science in the third century than the ludicrous one developed by him (p. 157). In the IIIrd century, the Mediterranean scientists were already privileged to stand upon the shoulders of such giants as HIPPOCRATES, EUCLID, ARISTARCHOS, ERATOSTHENES, APOLLONIOS, ARCHIMEDES, HIPPARCHOS, PTOLEMY, GALEN and many more. The Mediterranean science of those days was immeasurably superior to the native Chinese science of any time. Dr. SHRYOCK's views on European science seem to be very hazy. For exemple, apropos of the theory of humors he remarks (p. 57): "This doctrine probably has its roots in prehistory, and in its essentials is similar to the opening chapter of the *Jen wu chih*. The first scientific statement of this explanatory approach, as far as European literature is concerned, was probably made by HIPPOCRATES and GALEN,"—a singularly awkward statement considering that these two giants are almost six centuries apart!

In spite of these restrictions we should all be very grateful to the author for having made available to us for the first time a Chinese treatise as important and as interesting in many respects as the one which LIU SHAO composed almost seventeen centuries ago.

GEORGE SARTON.

Joseph Schacht and **Max Meyerhof.**—*The medico-philosophical controversy between Ibn Butlan of Baghdad and Ibn Ridwan of Cairo. A contribution to the history of Greek learning among the Arabs.* 124 p., plus 91 p. in Arabic, 5 facs. (Egyptian University, Faculty of arts, 13). Cairo, 1937.

IBN RIḌWÂN and IBN BUṬLÂN were two of the greatest physicians of the middle of the eleventh century. The first was a Cairene Muslim (c. 998-c. 1061), who became the leader of his profession in Cairo (where all his life was spent), the second was a Christian Baghdadite, who left his native city in 1048, travelled to Syria and Egypt, and finally settled down in Antioch where he died c. 1063 (1). He spent three years in Cairo (1049-52) and during that time there developed between him and his great rival a strong hostility.

They fell out apropos of a controversy which may seem insignificant (p. 15):

"Among the Arabic physicians prevailed the opinion, perhaps following some

(1) For quick reference, see my *Introd.* (1, 729-30).

Greek physiological theory, that the nature of the young of the bird was 'warmer' than that of the chicken, but that this warmth was compensated in its early stage by a strongly prevalent moisture. Now, when IBN BUṬLÂN arrived in Cairo he heard, at the occasion of a scientific meeting in the Vizier's palace, that AL-YABRÛDÎ (2), a Christian (Jacobite) physician of Damascus, had baffled the Egyptian physicians by an argument that led to the opposite conclusion, and that he had composed a short treatise entitled 'That the young of the bird is colder than the chicken.' He had based his assertion on the well-known fact that the chicken when just hatched from the egg is able to pick up its food, while the young of flying birds require several weeks fostering by their parents. As, according to the doctrines of ARISTOTLE and GALEN, bodies and organs of quick movement are 'warmer' than such of slow movement, the quickmoving chicken must be considered to be warmer than the young of the bird. IBN BUṬLÂN when told this thought that AL-YABRÛDÎ's conclusion was not supported by a sufficient argumentation, and he undertook to furnish anew the arguments in favour of AL-YABRÛDÎ's puzzling conclusion, although he did not agree with it. IBN BUṬLÂN qualifies the traditional view as the correct one and states that he composed his treatise (the first treatise of our publication) as an 'intellectual juggle and gymnastics' in order to test the intelligence of the reader. IBN RIḌWÂN must have felt himself hit, because IBN BUṬLÂN made strong allegations against an Egyptian physician, probably one of IBN RIḌWÂN's pupils, who had been present at the discussion in the Vizier's palace."

No less than five treatises were exchanged by the two doctors on this subject, the first, third and fifth being written by IBN BUṬLÂN, the second and fourth by IBN RIḌWÂN. The text of those five treatises is given in Arabic and also in English translation, together with a collection of all the biographical and bibliographical documents concerning both rivals.

To return to the controversy, "it is of special interest because the two adversaries tried to exhibit in it their entire erudition, particularly in Greek medicine and philosophy. Both of them were men of remarkable learning, but IBN BUṬLÂN was superior to IBN RIḌWÂN by his education in Greek and Syriac and by a remarkable training in the Islamic sciences, as well as in Arabic literature, joined to his familiarity with the tenets of the Christian faith, which he had probably acquired in Baghdad."

All the documents here published have been edited with the greatest care, as we might expect from the two authors, the MSS. used being properly discussed. In short we are given all the facts of the case in

(2) This AL-YABRÛDÎ (so named after the village Yabrûd near Damascus) was ABÛ-L-FARAJ JAWARJIS IBN YÛḤANNÂ. MEYERHOF has translated his biography from the *'Uyûn al-anbâ'* of IBN ABÎ UṢAIBI'A (pp. 66-9). AL-YABRÛDÎ flourished in Damascus and Baghdâd in the middle of the eleventh century; he was a correspondent of IBN RIḌWÂN. I did not include him in my *Introduction* because he did not write any books; he was simply a successful physician. (G. S.)

the best scholarly manner, and it becomes a little easier to write a curious chapter of the history of scientific thought at the time of the Arabic golden age, the age of AL-BÎRÛNÎ and IBN SÎNÂ. GEORGE SARTON.

Anne Holtsmark.—*En islandsk scholasticus fra det 12. århundre.* Oslo 1936. 121 pp. (Skrifter utgitt av Det Norske Videnskapsakademi i Oslo. II. Hist. Filos. Klasse. 1936, No. 3.)

This book is mainly an investigation of the Old Icelandic text generally known as " The First Grammatical Tract of the Snorra Edda," edited with a translation and a commentary by FINNUR JÓNSSON and VERNER DAHLERUP, Copenhagen, 1886. The author endeavours to find the sources and, if possible, the writer of this important text. To this effect the grammatical literature of 12th century Europe is taken into consideration. The chapters treat of the alphabet, the form of the characters as described in the tract compared with the eldest Icelandic Mss. still extant and the general script of the 12th century, especially the Anglo-Norman; further the author's pronunciation of Latin as it is indicated by the sound he gives the characters, his learning as it is reflected in quotations and in his grammatical theory, his knowledge of contemporary Icelandic literature, and the possibility of arriving at a conclusion on the identity of the author. The result is that the author must have studied in France or Norman England about the middle of the 12th century, rather 1160-70 than earlier. He shows reminiscences of the grammarians commenting on PRISCIAN, from REMIGIUS of AUXERRE to PETRUS HELIE, and he shares his linguistic views with GIRALDUS CAMBRENSIS and the school of PETRUS COMESTOR. It is, then, probable, though not proved, that the author was one of the two Icelandic bishops, THÓRLAK or PÁLL, who studied in Paris and Lincoln in the latter half of the 12th century. The comparison with the Icelandic Mss. extant point to the same conclusion. As the material is very limited, a definite opinion on this point is not ventured. The investigation shows the close connection between Iceland and the world of general learning from the very beginning of written literature on the island. A. H.

Edward W. Strong.—*Procedures and Metaphysics: A Study in the Philosophy of Mathematical-Physical Science in the Sixteenth and Seventeenth Centuries.* viii+301 pp. BERKELEY, University of California Press, 1936 ($ 2.50).

This is one of the most important studies of sixteenth-century scientific thought to appear in recent years. Professor STRONG's thesis is that the great revival in the mathematical sciences which culminated

in the work of GALILEO was not primarily inspired by Renaissance neo-Platonism with its metaphysical idealization of mathematics, but was due to the development of methodological procedures within the restricted subject-matter of the sciences themselves. In short, he maintains that, among the leading scientists, the procedures were evolved first and that the metaphysical structure and sanctions were conceived later. His book thus takes issue with E. A. BURTT's well-known work, *The Metaphysical Foundations of Modern Physical Science*, or at least with those sections of Professor BURTT's study which imply that it was the Pythagorean element in the philosophy of the Italian neo-Platonists of the fifteenth century which created a renewed interest in mathematics as a tool for the investigation of nature and caused men to turn from classification to measurement.

Mr. STRONG insists upon the necessity of distinguishing between two traditions in any historical study of mathematical thought in the Renaissance. One is the metamathematical tradition which assigns an ontological significance to number, regards the objects of mathematics as constituting an intermediate realm between the sensible realm of material objects and the realm of forms or ideas, and advocates the study of mathematics chiefly as a preparation for the speculative, mystical study of divine number, the "form of forms", pattern of all created things. This tradition, originating in PLATO and his adaptation of earlier Pythagorean doctrines, was developed and passed on to the Western World by the mathematical writers among the neo-Platonists of the early Christian era, notably NICHOMACHUS OF GERASA, THEON OF SMYRNA, and PROCLUS.

The other tradition, equally important in the Renaissance, drew its inspiration from the *Elements* of EUCLID. In Euclidean geometry the sixteenth-century mathematicians found a science which, within the limits of its restricted subject-matter, established the meanings of its basic concepts and proceeded by the rigid logic of geometrical proof to erect a structure by which the validity of their mathematical operations could be tested and demonstrated without any appeal to metaphysical sanctions. The works of other great mathematicians of antiquity, such as APOLLONIUS OF PERGA, PAPPUS, and ARCHIMEDES, contributed to this tradition—a tradition in which geometry was a useful and indispensable tool in the solution of the practical problems of scientific investigation. From their study of the complete text of EUCLID—in which they found each theorem and construction mathematically proved instead of asserted upon authority as in the medieval epitomes of the *Elements*—and from their putting EUCLID's principles to the test in actual experimental work, the scientists acquired their confidence in mathematics as means

for demonstrating relationships between physical phenomena. Their approach to problems was methodological, and concerned with the mathematical justification of their operations and procedures.

Such an approach, furthermore, was conducive to scientific progress, for it directed men's activities toward measurement rather than toward arbitrary classification upon the basis of metaphysical distinctions. Quite the opposite was true of the approach of the neo-Platonists, with their mystical emphasis upon the cosmological significance of number. FICINO, PICO DELLA MIRANDOLA, and the other leaders among the neo-Platonic philosophers of the fifteenth century belonged to the metamathematical tradition of THEON and PROCLUS, which advised men to pursue mathematics as a preparation for higher philosophical speculations rather than to employ it for its own sake as an instrument of physical investigation. The Pythagoreanism of the neo-Platonists, taken by itself, was therefore inimical to the advance of science.

As evidence for his thesis Mr. STRONG cites the words of the scientists themselves, as found in the prefaces and the texts of their works. TARTAGLIA, CARDAN, VIETA, CATANEO, CLAVIUS, ORONTIUS FINEUS, STEVIN, VEGLIA, LEONARDO DA VINCI, BENEDETTI, and GALILEO are the chief authors quoted. Their testimony shows that they all shared a methodological approach to their problems, that they looked to " procedures rather than to metaphysics as the basis for the meaning of definitions, concepts, distinctions, and propositions of mathematical-physical science." In KEPLER there is a mingling of the two traditions, but KEPLER's willingness to reject all theories which were in disagreement with observations saved his scientific work from being vitiated by his predisposition to metaphysical philosophizing.

The facts presented by Mr. STRONG amply warrant his conclusion that it is " historically inaccurate to assert that a metaphysical revolution preceded and directed the use of mathematics in physical study," and that the assumption that " the Platonism of FICINO and GIOVANNI PICO provided a metaphysical construction under which the mathematical investigators conceived their work " is unjustified. Future students of Renaissance science will have to pay close attention to the distinction he has pointed out between the metamathematical and the methodological traditions. But at the same time they should not forget that in the sixteenth century these two traditions were so closely intertwined that disentangling them is difficult. Mr. STRONG, in proving his point, frequently risks giving his readers the impression that the Renaissance mathematicians were more alert to the difference between the two attitudes and more careful to distinguish between them than was actually the case. The scientists usually were as well acquainted with the

commentary of PROCLUS on the *Elements*—one of the main sources of the metamathematical doctrines—as they were with Euclid itself. Consequently, those who were metaphysically inclined would usually, in their eulogies of mathematics and their pleas for its more general cultivation, give equal prominence to the utilitarian argument of its practical value in science and technology and to the familiar philosophical and theological arguments of the neo-Platonists. A typical instance is JOHN DEE's preface to the English translation of EUCLID (1570). Although Mr. STRONG lists him among the adherents of the metamathematical tradition, DEE seems more truly to represent, like KEPLER, a peculiar mixture of the two points of view. Mr. STRONG's remark, in connection with DESCARTES, that the philosopher who is also a mathematician "may use one method in his actual scientific work and advocate another in his philosophical writing" applies with equal justice to many sixteenth-century scientists.

As a consequence of Mr. STRONG's findings, neo-Platonic Pythagoreanism, as revived in the fifteenth century, may no longer be assumed to be the antecedent cause of the enthusiastic application of mathematics to the solution of physical problems, but must yield this place to a successful methodology founded upon EUCLID's *Elements*. Nevertheless, as a concurrent tradition to which philosophically-minded scientists could appeal and which they could oppose to the prevailing Aristotelian metaphysics, it must still be considered an important and pervasive influence in the scientific thought of the Renaissance.

Stanford University. FRANCIS R. JOHNSON.

M. C. Bradbrook.—*The School of Night: A Study of the Literary Relationships of Sir Walter Ralegh.* viii+190 pp. Cambridge: at The University Press, 1936 (6 s.), New York: THE MACMILLAN Company, 1936 ($ 2.25).

To the historian of Renaissance scientific thought the activities of THOMAS HARRIOT, one of England's most learned mathematicians and astronomers, and his friend and patron, the versatile-minded Sir WALTER RALEGH, are subjects which earnestly invite more searching investigation. The importance of this pair is enhanced by the many contemporary references to their ideas, which testify to their influence upon a wide circle of friends and associates—a circle that included the ninth EARL OF NORTHUMBERLAND, MARLOWE, JONSON, CHAPMAN, WALTER WARNER, ROBERT HUES, MATHEW ROYDEN, and many other persons prominent in science and literature during the Elizabethan age. But it is the historians, not of science, but of literature who have lately been most eager in the study of the intellectual interests of the HARRIOT-RALEGH

group. The theory that SHAKESPEARE, in *Loves Labour's Lost* (IV, iii, 251), refers to this group by the nickname of " the School of Night," first put forward by ARTHUR ACHESON in *Shakespeare and the Rival Poet* (1903), has recently been elaborated in a number of books which analyze the play as a topical satire of RALEGH and his retainers produced for the amusement of the faction of the EARL OF ESSEX, RALEGH's adversary in politics and in a literary " war " that raged between the two in the years 1593-94 (1).

Miss BRADBROOK's work is the latest study of this supposed " School of Night " coterie. It adds no new facts, however, to our fragmentary information concerning HARRIOT, RALEGH, and their associates, nor does it attempt to do so. Instead, the author assumes as proved a supposition that her predecessors have more often allowed to remain frankly conjectural—namely, that there was a definite school or society in the nineties of which RALEGH was the patron and HARRIOT the master. From this assumption she proceeds to determine, by means of an examination of the writings of RALEGH, MARLOWE, CHAPMAN, and others, what the doctrines of this " school " must have been ; but the doctrines thus deduced prove to be commonplace elements of Renaissance scientific theory and of the rationalistic current of sixteenth-century thought (2). Therefore their appearance in the works of various members of RALEGH's circle does not argue that they were consciously evolved as the avowed tenets of the group.

In the course of her study, Miss BRADBROOK makes a number of acute critical comments upon the poetry of RALEGH and others. But her main thesis is built from a tissue of conjecture, patched together at weak spots by the convenient hypothesis that the literary productions in the RALEGH-ESSEX " war " were seen in manuscript by members of the opposing faction before their publication. This structure, once erected, is treated as if it were staunchly buttressed with reliable historical evidence. The reader, therefore, must be on the alert to disentangle pure assumption from demonstrable fact. He may well inquire precisely what authority there is for the existence of the " School of Night." Certainly there are scattered references, in the literature and documents of the Elizabethan period, which afford ample proof that the men listed as members of the " school " were acquainted

(1) See the introduction to the New Cambridge edition of *Loves Labour's Lost* (1923); *Willobie his Avisa*, ed. G. B. HARRISON (London, 1926); FRANCES A. YATES, *A Study of " Loves Labour's Lost "* (Cambridge, 1936); for MARLOWE's relations with the group, see F. S. BOAS, *Marlowe and his Circle* (Oxford, 1929).

(2) Cf. GEORGE T. BUCKLEY *Atheism in the English Renaissance* (Chicago, 1932), pp. 129-52.

with HARRIOT and RALEGH and at one time or another had dealings with them. But the theory that these men were intimately associated and met either formally or informally as a group to study science and philosophy under HARRIOT's direction rests upon the following three items of evidence, each of doubtful value:

1. The interpretation—plausible in many respects, but not susceptible of definite proof—that *Loves Labour's Lost* satirized the RALEGH faction and that the casual allusion to the "School of Night" was a recognizable "hit" at one of its chief activities.

2. The reference by the Jesuit ROBERT PARSONS in his *Responsio ad Elizabethae edictum* (1592) to Sir WALTER RALEGH's "school of atheism" and the "conjuror that is master thereof." It must be remembered in this connection that PARSONS was an escaped Catholic plotter who had every motive for hurling scandalous charges of heresy, no matter what their truth, against those in power at ELIZABETH's court. Therefore his testimony, apparently based upon nothing more than popular rumor, cannot be accepted without weighty reservations.

3. The report of an unknown spy set to watch RICHARD CHOLMELEY, also a spy, that CHOLMELEY said that "Marlowe tolde him that he hath read the Atheist lecture to Sir Walter Raleigh and others" (Harleian MS. 6848, fol. 175). This sort of hearsay evidence is not the best that one could wish for.

On the principle that where there is so much smoke there must be some fire, we way well believe that many eminent Elizabethans frequented RALEGH's house in London, and that on occasion HARRIOT may have performed some experiments in optics for their benefit and thereby given rise to the vulgar rumors of his occult powers. This was the common fate of researchers in optics, for JOHN DEE's earlier experiments with lenses and mirrors had caused him to be branded as a magician, to his great discomfiture. The existing evidence, however, does not warrant our going farther and assuming as an established historical fact that a definitely identifiable coterie, well known to contemporary Englishmen, met under RALEGH's roof to study science and philosophy with HARRIOT as their master. The possibility of such meetings must be granted, and their existence, if proved, would have great significance in the history of science in England. But for proof of more than casual gatherings we must await the discovery of some additional evidence which further research may ultimately bring to light.

Stanford University. FRANCIS R. JOHNSON.

Herbert Eugene Bolton.—*Rim of Christendom.* xv + 644 pp. New York : The MACMILLAN Co., 1936, $ 5.00.

We live in an age of superlatives, of superlatively large bridges, of superlatively bad morals, of superlative compromise, of superlatively good and superlatively bad things, in fact we live in a period which may well come to be known to future generations as the Superlative Period. Perhaps one of the most satisfying compensations which the Superlative Period has to offer us who live in it is the variety and the number of excellent works which may be critically appreciated as superlatively good. The present volume falls into such a category. Professor BOLTON has put twenty-five years of loving and exhaustive labour into the collection of materials for the making of this definitive biography of the Pacific Coast pioneer and Jesuit missionary to the Indians EUSEBIO FRANCISCO KINO (1645-1711), leaving no place unvisited and no repository unexamined in his search for materials bearing upon his subject. The result is a very remarkable, a very informative, and a very readable story.

KINO was born in the hamlet of Segno in the Italian Tyrol on August 10, 1645; he came of a good stock not unpossessed of means. He attended school at Trent and later entered the Jesuit College at the same place "where he excelled at mathematics". A vow taken during a mortal illness led him to devote his life to the Society of Jesus and the Indian Mission, and following a long course of studies pursued at Freiburg, Ingolstadt, Innsbruck, München, and Oettingen, KINO finally set foot in Mexico, following many mishaps and adventures, in 1681. The story of his pioneering explorations in California and Mexico from that time until his death in 1711, the manner in which he built his churches, and brought "civilization" to the heathen Indian is a record of triumph in the face of great odds. KINO was an excellent cartographer, as many of the maps which illustrate this volume well show. His *Exposicion astronomica de el cometa*, published in Mexico City in 1718, is scientifically an unimportant work, but it does serve for a moment to bring him into the ranks of the astronomers. It is chiefly remarkable for the fact that it drew a rather amusing reply from Don SIGÜENZA Y GONGORA, the noted Mexican scholar. But this was merely an incident in KINO's life, a brief moment which has caused him to be brought into the pages of this journal. For the rest, Professor BOLTON's study should prove of great interest to historians of the processes of civilazition.

New York University. M. F. ASHLEY-MONTAGU.

Blaise Pascal. — 1. *The Physical Treatises of Pascal: The Equilibrium of Liquids and the Weight of the Mass of the Air.* Translated by I. H. B. and A. G. H. SPIERS with introduction and notes by

FREDERICK BARRY. No. 28 of the series, "Records of Civilization, Sources and Studies", edited under the auspices of the Department of History, Columbia University; AUSTIN P. EVANS, General Editor. XXVIII + 181 pages including index, three plates. Price : $ 3.25. New York, Columbia University Press, 1937.

2. *Pascal, the Life of Genius*, by MORRIS BISHOP. XI + 398 pages including index, 6 plates. Price : $ 3.50. Baltimore, The WILLIAMS and WILKINS Co., 1936.

Works on BLAISE PASCAL (1623-1662) are numerous. A "Bibliographical Note" at the end (pp. 171-173) of the first book under review gives an excellent critical survey of the most important of these. Many are now somewhat scarce and only a few are in English; worthy English additions, such as these two books, are therefore very welcome.

1. PASCAL's brief but brilliantly ingenious work in physics entitles him to rank with ARCHIMEDES and STEVIN as one of the founders of the science of hydrostatics. It is completely summarized in his *Traitez de l'équilibre des liqueurs et de la pesanteur de la masse de l'air* (written before 1654, but not published until 1663, a year after his death) of which this volume is a translation. Because it provides "a succinct yet entertainingly vivid picture of the spontaneous enthusiasm and experimental ingenuity that characterized the scientific work of the seventeenth century", because it logically develops a single thesis and so "exhibits, as no commentary could, the powerfully synthetic thought of this master of scientific method", because it is an early, yet striking, illustration of the modern scientific method of hypothesis and experimental verification, and because in its strong simplicity it is a model of scientific style, this work deserves a high place among the classics of the scientific method. It should be read, along with NEWTON's *Opticks* and CAVENDISH's *Experiments to determine the Density of the Earth*, by every young physicist, and thanks are due to the editors and translators of this volume for making it readily available.

The *Traitez*, as put together by PÉRIER and published in 1663, contained also a preface and notice (both probably by PÉRIER), a table of contents, two fragments of a long work by PASCAL on the same subject (proposed but apparently never completed), the *Récit de la grande expérience de l'équilibres des liqueurs* (the famous Puy-de-Dôme experiments published in 1648) together with further observations and correspondence of PÉRIER, and a discussion of BOYLE's *New Experiments Physico-Mechanicall.* All of these are carefully translated and included in the present volume. In addition there are a "Foreword" and critical notes by BARRY and a valuable appendix containing translations of very full excerpts from the related investigations of STEVIN, GALILEO and TORRICELLI, some of

which are thus made available in English for the first time; these serve to place PASCAL's work in its proper perspective and make this small volume an important contribution to the literature of physical science.

2. PASCAL's life, short but packed full of prodigious accomplishments, warfare, excesses of self-torture and physical suffering, offers an attractive subject for biographers. However, these usually find it difficult to be neutral regarding their subject; they either cannot forgive him for not accomplishing in mathematics and science what his unquestioned genius should have made possible or, like his sister, GILBERTE, will admit no fault in him and struggle to prove his sainthood. MORRIS BISHOP belongs to neither of these groups; in spite of the fact that he is writing for the layman rather than the scientist or the historian and that he is interested in PASCAL's mind rather than in the history of science, he succeeds in painting an objective as well as an enthusiastic picture. The elements which combine to make up this picture are indicated by the chapter headings : I. The Prodigy; II. The Inventor; III. The Convert; IV. The Physicist; V. The Mathematician; VI. The Man of the World; VII. The Lover;VIII. The Mystic; IX. The Penitent; X. The Polemist; XI. The Philosopher; XII. The Saint; XIII. The Man. These are treated with sympathy, eloquence, and understanding, and are combined with skill and insight. If the relative emphasis is not always that of the historian of science, this results in little or no distortion.

The scientist and historian, as well as the layman, will read this book with profit and pleasure; its value to them, as well as the objectivity of the treatment, is increased by the very full statement of authorities in the critical notes that fill 35 pages at the close of the book.

California Institute of Technology. E. C. WATSON.

John F. Fulton. — *Sir Kenelm Digby.* 75 p., New York : PETER and KATHERINE OLIVER, 1937.

From 15 April to 13 May 1937 an exhibition of Sir KENELM DIGBY's works and writings relating to DIGBY was held at the Grolier Club in New York. For the organization of this exhibition Professor FULTON was in large part responsible, and on its opening day he read a paper before the Club on DIGBY which is here pleasantly printed and illustrated together with some appendices listing the items shown, some that were not but which are referred to in the text. In the space of a short lecture Professor FULTON contrives to tell a great deal about that erratic genius, Sir KENELM DIGBY. Moreover, he is able to say a number of new things about him, particularly in connection with his friendship with DESCARTES and his advocacy of HARVEY. As scientist, and stimulator of relations between thinkers; as collector of

books, and bestower of books upon men and libraries; as writer, epistolary and philosophical; and as man, "DIGBY the Great, the Valiant, and the Wise", of all these facets of this remarkable man Professor FULTON speaks informatively and with charm. It is the most attractive short account of DIGBY that we have.

The place of DIGBY in the history of English science has never properly been evaluated; his association with the *powder of sympathy* seems to have obscured all else about him with the exception of his tragic and injustly suggested fatal association with the beautiful Venetia. It is a not uncommon fate of great men. As Miss MARJORIE NICOLSON has said in that most admirable of books, *The Conway Letters*, (Yale, 1930; *Isis* 16, 141), his versatility was his doom. In the same work Miss NICOLSON has also pointed out that DIGBY was one of the early links between the Royal Society and the continental Academies, sending back to England occasional reports of things seen and discussed, and news of new inventions and discoveries. Also he was very actively associated with the establishment of the Royal Society. Also he wrote brilliantly, and often soundly, if with imagination. Also... but why does not someone sit down and write a full length study of the man? It is a rare opportunity.

New York University. M. F. ASHLEY-MONTAGU.

G. N. Clark. — *Science and social welfare in the age of* NEWTON. Oxford, Clarendon Press, 1937. 159 pp. $ 2.50.

The significance of this little book can best be appreciated within the context of the author's earlier contributions to historiography. It signals the progressive achievement of its distinguished author in relating the intellectual development of a culture to other activities current in it. For two decades, Professor CLARK has persistently traced the interrelations between spheres of culture and society, eschewing both the conventional divisions of history into political, economic and constitutional fields and the monistic interpretations which find an all-too-ready solution to problems of analysis by attributing all developments to a single factor. The third alternative, of complacently stating that society is a complex web of ramified relationships and letting it go at that, is likewise ruled out. Instead, he presents a coherent picture of the ways in which these spheres are concretely connected and the extent to which these connexions proved determinative. He has no thesis, in the invidious sense of the term, and the result is a clear picture of a nice balance of interacting forces. From his earliest historical work, *The Dutch Alliance and the War against French Trade* through his studies of *The Seventeenth Century* and the *Later Stuarts*, he has avoided the application of ready formulae to historical materials, and in each case, his treatment has left a precipitate

which increased our understanding of the role of intellectual life in society.

The present study climaxes this development by concentrating on the various interrelations between science, technology and society in the Newtonian period. It supplants the materialistic interpretations by tracing the limits of economic influences *sensu stricto* and by clearly analyzing other extra-scientific factors which also played a part in the scientific advance of this age. It provides a supplement and corrective to such economistic discussions as those of Professor HESSEN by describing the concrete mechanisms through which economic influences operate. The selection of problems — the thematics of science — is found to have been influenced as well by military requirements, medicine, the arts, religion and the disinterested search for knowledge. As for the method of experimentation, "it was taken over, not once and for all but by long-continued contact, from art, from mining, and from the skilled handicrafts in general." For BOYLE, HOOKE and many of their contemporaries, *homo faber* and *homo sapiens* were cooperatively engaged in extending the bounds of empirical knowledge.

In adding religion to the list of factors which have significantly influenced the advance of science, Professor CLARK has again escaped the conventional folklore of historiography. He does not casually dismiss the problem by recourse to either of the facile formulas which have proved so popular; namely, that science and religion have historically constituted a pattern of inescapable contrariety or that they are completely unrelated since they are concerned with different problems. A considerable number of seventeenth century scientists found added motivation for scientific study in their religious values. NEWTON's interest in theology was not an inexplicable aberration but was organically linked with his interest in the riddle of the universe. In this general connection, a footnote may be added to Mr. CLARK's rejection of MAX WEBER's thesis that ascetic Protestantism "placed science in the service of technology and economics." Neither WEBER nor any of the other investigators who have observed this relationship claim that technologically-oriented science could have arisen only from ascetic Protestantism. Such a contention would be manifestly absurd in the light of developments prior to the Reformation. The point is that emotionally toned beliefs of Protestantism were more apt to lead to such an interest than were the Catholic convictions which were largely neutral, or even antagonistic, to such pursuits. Later studies have invariably found this *differential propensity* of Protestants for that science which involved practical implications. Independent of the religious factor, other developments have *also* pointed in this same direction.

Within the confines of a brief review, it is impossible to summarize all the suggestive hypotheses which Mr. CLARK has introduced. One of the more important of these pertains to the varying susceptibilities of the sciences and technology to socio-economic influences. In Mr. CLARK's own words :

> At certain points science began to influence technology long before it touched it elsewhere; at these points again the state began earlier to assist the union, and at these the combinations of science, business and policy assumed something like their modern forms although, in the greater part of their activities, they were each still comparatively simple, self-contained, and indifferent to one another. What we have to trace is not a process which, at each stage, affects equally all the departments of economic life, all the branches of scientific thought, and all the aspects of social policy. We have to observe how certain branches of science influenced technology long before others could; how certain crafts became scientific far in advance of the rest; how the state fostered these and not others. We have to see not a gradual and general mutual approach of these elements of society, but the joining of contact, first at isolated points, then at more points, finally almost everywhere. The nature of the joining can scarcely be understood unless we remember that it was made in this piecemeal fashion (22).

By the seventeenth century, astronomy, with its close affiliation with navigation, was most clearly influenced by technological and, derivatively, economic considerations. By the same token, no other science of this period was *equally* encouraged and fructified by extraneous influences.

The economic historian who is concerned with the growth of technology will find in this work further documentation and application of Professor PLANT's thesis that "every price change, by creating cost difficulties in certain fields and opportunities for profit-making in others, provides a double stimulus to invention." The rise of prices and expansion of production in the latter sixteenth century, with an attendant increase in the scarcity and costliness of labor, was intimately involved in the technological development of that period, SOMBART's judgment notwithstanding. But, as Mr. CLARK suggests, such conditions are not strictly determinative since they may lead to alternate modes of adjustment which, in the case of agriculture for example, involved changes in social organization rather than mechanization.

The merits of this book are not limited to its explicit content. The implications for further research along these lines are of the first importance. They should be considered by every student of the social aspects of science and technology.

Harvard University. ROBERT K. MERTON.

Cecil Wall. — *The History of the Surgeons' Company*, 1745-1800. London, HUTCHINSON, 1937, 256 pp., 10 pls., price 10/6.

We are indebted to Dr. CECIL WALL for filling in interesting fashion

a gap in the history of Surgery in London. As D'ARCY POWER points out in the foreword, the early and modern periods are fairly well known but the Georgian era has remained obscure.

In 1919 the Company of Barbers generously founded a lecture given annually at the Royal College of Surgeons in memory of THOMAS VICARY, anatomist, surgeon and first master at the fusion of the Barbers and Surgeons into a single company in 1540.

In the stirring year of the "forty-five" the Surgeons of London broke their long association with the Company of Barbers and established an independant company, the Surgeons' Company, which in turn became upon its dissolution in 1800, the Royal College of Surgeons of England. Fittingly Dr. WALL has expanded the Vicary Lecture which he gave in 1935 into the present volume. As archivist to the Society of Apothecaries and Fellow of the Royal College of Physicians, he has had access to a rich treasure of documentary records which, as he says, could not be displayed within the compass of a single lecture and yet which seemed worthy of exhibition to those who are interested in the evolution of the profession of Surgery.

Dr. WALL carefully traces from these documents the movement that led to the separation of the Barbers and Surgeons and to the establishment of the Surgeons' Company. The Surgeons, after two centuries of union, now feeling the inconveniences of the union and desirous of progress, pled for separation on the grounds that though united for purposes of administration, it had been recognized from the time of their fusion that Barbery and Surgery were distinct crafts. The separation was opposed by the Barbers as a manifest injustice, for the Surgeons at the union had acquired and enjoyed the powers and possessions of a wealthy and prosperous company and now that the surgeons had enriched themselves at the cost of the barbers, who had lost the exercise of a more profitable profession, the surgeons were for sloughing the poorer body. Dr. WALL shows how miserably the new company established to further the development of surgery, failed in its purpose. Control of this new body fell into the hands of a few who functioned for the most part as a board of examiners more interested in diverting the funds of the corporation for the provision of expensive dinners than in progress. What became of the Surgeons' hall intended as a central institute for education, is described in a Philippic addressed to the Court by the contemporary surgeon GUNNING : "Your theatre is without lectures, your library without books and is converted into an office for your clerk and your committee-room is become his eating parlour and is not always used even in your own common business and when it is thus made use of it is seldom in a fit and proper state — if it is to be converted into an eating

parlour why should we not eat in it ourselves? Your dinners at the Tavern are exceedingly inconvenient and expensive and attended with great loss of time".

Through general inertia and the development of numerous irregularities, financial and otherwise, the author shows how the company was eventually forced to dissolve.

The aims, constitution, privileges, finances and development of the company are followed in detail from the records and give a lively picture of some of the activities and conditions of a London surgeon's practice in the eighteenth century.

The work will be of interest to those familiar with the history of surgery in England, for the new side lights it throws upon the activities of the many notable men who graced British surgery at this time and to those interested in the history of old London. It will doubtless have less appeal to the general reader.

Dr. WALL's work is carefully documented and covers a great deal of new material. There are several excellent and unusual illustrations. There are few errors but we note that GUNNING's Philippic is given as 1791 on page 58 and 1790 elsewhere.

There are a number of useful appendices covering the various officers, and a good index.

San Francisco. JOHN B. DE C. M. SAUNDERS.

André Cheynier. —JOUANNET, grand-père de la préhistoire 101 pp. (Publié sous les auspices de la Société Historique et Archéologique du Périgord) Brive 1936.

It is well known now that PHILIPPE SCHMERLING (1791-1836) and BOUCHER DE PERTHES (1788-1868) in establishing the evidence for the high antiquity of man laid the scientific foundations for the study of prehistory. Yet quite a number of investigators long before these men did their work also discovered such evidence. For example, J. A. ESPER in 1774 while visiting the cave of Gailenreuth, Bavaria, found a fragment of a human jaw together with the remains of a cave bear. (1) Again in 1797 JOHN FRERE, an Englishman, wrote of his discovery in a cave in Hoxne of flint stone implements and a jaw of an enormous size of an unknown animal. (2) Now neither of these discoveries, and others not mentioned here, attracted any notice. It was not until archaeologists like BOUCHER DE PERTHES, because of their own strong convictions, compelled the world to pay some attention to their findings, that scientists began to examine the evidence and finally to acknowledge its authenticity.

(1) P. C. SCHMERLING, *Recherches sur les Ossements Fossiles*, 1833, p. 58.
(2) *Archaeologia* XIII (1800), pp. 204-205.

But until such time as the learned world was ready to accept such radical theories with regard to man's past and for that matter, the earth's past with which it was connected, it was to be expected that many investigators would be ignored by their contemporaries and that the results of their investigations would be lost in the learned journals of their time. Even historians failed to notice the work of some of them, particularly if the scholar in question was a local figure.

This in a sense is the case of FRANCOIS V. JOUANNET (1765-1845) presented in this little book by Dr. A. CHEYNIER. In the author's opinion, JOUANNET ranks with TOURNAL, SCHMERLING and DE PERTHES as a founder of prehistory. But the historians and those working in prehistory have ignored him completely. BOUCHER DE PERTHES, JOLY, GEORGE ENGERRAND, CH. LYELL, DE CARTAILHAC, LUBLOCK, BOULE, MACCURDY — none of these historians have a word to say about JOUANNET's contributions to prehistory. To redress the wrong CHEYNIER has collected all the sections of JOUANNET's papers dealing with prehistory and included them in a chapter entitled *Documents*. Three other chapters, one an outline of the history of prehistory, another on the life of JOUANNET, and a last one on conclusions complete the book.

It is not important for us to say much about the life of JOUANNET, except that like a good many other intellectuals of the early nineteenth century he dabbled in very many fields. He worked in literature, the classics, statistics and archaelogy — to mention but a few of his interests. What we are concerned with here is his contribution to the progress in prehistory. Is the author justified in considering him one of the founders of this field of investigation?

A reading of the *documents* included in this book reveals that about 1814 in excavating on a hill in Périgueux, JOUANNET discovered some burnt bones, and a polished stone axe. He looked for more and found not only more polished stone implements but also the remains of a forge strewn with copper slags of rings and buckles. He classified the metal objects as of Gallic origin and the polished stone implements as of a period "*plus reculée*". He also drew this significant conclusion: "*à une époque dans la nuit des temps, il y eut sur le coteau d'Ecorne-Boeuf* (the name of the hill) *une manufacture d'armes en pierre, à laquelle, dans un siècle plus rapproché de nous et plus éclairé, succéda une usine gauloise ou l'on fabriquait en cuivre certains instruments, peut-être même des armes.*" (3)

In 1816 he wrote again of his discovery in a cave in another section of Périgord of flint stone implements together with bones of an extraordinary size. He was puzzled by these remains. He did not recognize the bones as those of extinct mammals.

(3) A. CHEYNIER, JOUANNET, p. 37.

In 1817 and 1818 he found similar remains in another cave. He admitted that he could not determine to what period they belonged, except that they seemed to belong to "a very remote past."

His most important discovery he made in the cave of Badegol (Dordogne), where he found crude stone implements — very different from the neolithic axes he found in Ecorne-Boeuf. But here too he was not very sure of his ground. In his report written in 1834, he described very carefully the crude implements which seemed to him to belong to a very early period of the art of tool making. He compared them with the polished stone axes which "seemed to belong to an epoch of perfection". But then he posed the question "*Mais quel intervalle de temps sépara ces deux époques? Est-il même bien certain que nous ne prenions pas pour différence d'époques ce qui ne serait qu'une différence de destination d'instruments? Je ne sais ... Avouons-le, tout est mystère pour nous dans cette primitive industrie qui fut commune à tous les peuples dans leur enfance.*" (4)

Now let us consider briefly the work of TOURNAL, SCHMERLING and DE PERTHES.

TOURNAL, DE CHRISTOL and others who were at work about the same time as JOUANNET were actively engaged in collecting evidence for man's high antiquity. They were unearthing what they considered human fossils of an antediluvian period. They were arguing against catastrophism and insisting that even on purely theoretical grounds there was no justification for the assumption of man's late appearance (5).

In 1833, a year before JOUANNET described the paleolithic remains (which he failed to recognize as such), P. SCHMERLING published his *Recherches sur les Ossements Fossiles*. He had been at work in the caves of Liège since 1829, and in 1833 presented definite evidence, without any hesitation, of man's remote past (6). Already in 1836 DE PERTHES concluded that the implements of primitive man would be far cruder than the stone axes of the recent stone age. When he finally did find them they were so crude that it was hard to believe they were the work of man (7).

JOUANNET on the other hand stumbled on evidence which was very material but did not recognize it. He found bones of animals, that were undoubtedly the remains of an extinct species, together with stone implements. He did not succeed in identifying the animals' remains,

(4) *Ibid.* p. 64.

(5) DE CHRISTOL, Notice sur les Ossements Humains Fossiles, Montpellier, 1829, p. 25.

(6) See P. C. SCHMERLING, *op. cit.*, p. 177.

(7) B. DE PERTHES, Les Antiquités Celtiques et Antédiluviennes, Paris, 1849, vol. II, p. 36.

although he did suggest that the stone tools belonged to a remote pas.. He came very close to distinguishing between paleolithic and neolithic remains but hesitated. He did, however, very fine work as an archaeologist in studying the Gallo-Roman in Dordogne and in the Gironde. He wrote excellent reports of his findings. He gave accurate descriptions of objects discovered. He made chemical analyses of the fossil bones and of the bronze of axes. By very careful description he showed that bronze axes were modeled after those of polished stone. His finding bronze and stone tools in the same places, led him to conclude that bronze age followed that of stone and preceded that of iron. CHEYNIER claims that he arrived at this classification before THOMSEN. This is no doubt true. But GOGUET in 1758 made a similar classification of prehistoric times. And so did LUCRETIUS before him.

JOUANNET may perhaps be excused for failing to identify the remains of extinct fauna, since the great CUVIER himself refused to admit discoveries made by AMI BOUÉ and others. Yet such an identification was an essential link in the chain of evidence of man's remote past and in the progress of our knowledge of prehistory. Hence it seems to us, after careful examination of the evidence, JOUANNET can be considered a very good archaeologist but by no means a founder of prehistory in the same sense as SCHMERLING and BOUCHER DE PERTHES.

Brooklyn, N. Y. PHILIP SHORR.

Isaac Jones Wistar. — *Autobiography of Isaac Jones Wistar*, 1827-1905. Pag. vii + 528. Philadelphia : The Wistar Institute of Anatomy and Biology, 1937, ($ 5.00).

ISAAC JONES WISTAR (1827-1905) was the grandnephew of GASPAR WISTAR (1761-1818); that same GASPAR WISTAR who was from 1792 to the time of his death in 1818 Adjunct Professor and then full Professor of Anatomy in the University of Pennsylvania. During the period of his incumbency of that position GASPAR WISTAR accumulated a large collection of materials relating to human anatomy which, following his death, was presented by his widow ELIZABETH MIFFLIN WISTAR to the University of Pennsylvania. In 1892 this collection, which had come to be known as the Wistar, or Wistar and Horner Museum, was incorporated under a new name as *The Wistar Institute of Anatomy and Biology*. The building then erected and the endowment for its adequate maintenance were provided by the author of this extraordinary autobiography, ISAAC JONES WISTAR.

The generosity which made The Wistar Institute possible will confer a lasting grace upon ISAAC WISTAR's name, and his autobiography, now fittingly made available by the Press of the Institute which he brought

into being, will add fame to that grace. The volume was originally issued in 1914 in an edition of 250 copies intended for a 'cautious' private circulation. The present volume is issued in a larger "limited edition", and differs from the earlier edition in the restoration of some passages omitted then and in the addition of an addendum, by EDMOND J. FARRIS, bringing the late Director MILTON J. GREENMAN's 1914 account of the history of the Wistar Institute up to date.

The life and adventures of ISAAC WISTAR read like the "cowboy and Indian" stories which the generation that came into being in the year in which ISAAC WISTAR died will have no difficulty in recollecting. It is naturally a most exciting story, despite the somewhat stilted style of the author, and conveys a picture of the opening up of Western America upon which historians will not fail to draw. From the pages of the book ISAAC WISTAR emerges a character of heroic proportions. It is unnecessary to apply the usual adjectives here; not that they would be too pale to fit our subject, but that they would be superfluous; those who read this book will be able to supply their own. All that it is necessary to say here is that the account of the pioneering *Wanderjahre* given by WISTAR will match any yarn of its genre that has ever been told of adventure and romance in America. Unfortunately, WISTAR seems to have had a habit of understatement which takes much of the feeling out of his story, but as a rugged American individualist, there appears to have been little place for that commodity in his practical economy. There can, however, be little doubt of the kindness of his heart and of his noble spirit. His sympathy and attachment to the Indians, and his strictures upon the white man and his civilization, testify to that deep interest in the welfare of humanity which culminated in the foundation of the Wistar Institute.

In his later years WISTAR became interested in Natural History, and was a member of a select circle of scientists who used to meet informally, in Philadelphia, once a fortnight. In 1892 WISTAR was elected President of the Philadelphia Academy of Natural Sciences.

New York University. M. F. ASHLEY-MONTAGU.

Margaret Farrand Thorp.—CHARLES KINGSLEY, 1819-1875. x+212p. 5 pls., Princeton, Princeton University Press, 1937. Price $ 3.00.

CHARLES KINGSLEY was a Victorian to the core, an aristocrat with strong liberal leanings and influence, tutor to EDWARD VII, Chaplain to the Queen, and Canon of Westminster Abbey. He was a voluminous writer of essays and novels, an exceedingly popular professor of history at Cambridge, and a lecturer of even wider popularity. Catholic in

his interests and sympathies, his wide reading and broad concerns were incompatible with depth of learning; hence, the criticism by scholars of his *Roman and Teuton*, which so convinced him that he resigned his professorship. Less creditable to his intellectual fairness was his attack upon NEWMAN, and his lame retreat before the latter's brilliant *Apologia*.

His popularity with the British middle class placed him in a position of influence upon the attitude of the reading public on current scientific movements such as Darwinism and sanitation. He had an amateur's interest in natural history, wrote *Glaucus, or the Wonders of the Shore*, *Town Geology*, and *Water Babies*, each of which ran through several editions; reviewed scientific books in the *Reader*, *Fraser's Magazine* and *Good Words*; and lectured on Superstition and Science at the Royal Institution. During his residence at Chester he organized a botany class of shopmen and clerks which grew into the Chester Natural Science Society with 350 members. He was elected to both the Linnean and the Geological Society and had an extensive correspondence with leading scientists. As an outcome of his reading preparatory to writing *Hypatia* he became interested in the history of science and wrote popular accounts of *Alexandria and her Schools*, of RONDELET, and of VESALIUS. His acceptance and advocacy of the theory of natural selection did much to offset the stupidity of the blundering bishop and the ceaseless and intemperate attacks upon Darwinism by that other Victorian curate-naturalist, FRANCIS ORPEN MORRIS.

A major service of CHARLES KINGSLEY in the field of applied science arose from his interest in and constant advocacy of sanitation beginning long before PASTEUR's discoveries. He himself had suffered from an attack of "English cholera" in 1834 and in the epidemics of 1849 and 1854 he did brave service making house-to-house visitations and using both pulpit and pen to arouse the apathetic British taxpayer to the necessity of self-sacrifice of pocket in the interests of cleanliness and sanitation. Lectures, tracts, sanitary handbooks, Sanitary Associations, and sermons proclaimed the gospel of health and cleanliness, and reverberations of these campaigns are scattered through some of his novels.

The author utilized the private collections of papers and correspondence of the family, and of others, and the extensive collection in the British Museum. Her treatment is analytical and critical and she draws extensively upon his writings in illustration of his opinions and outlook. A full bibliography is appended. The frontispiece is from the LOWES DICKINSON portrait in the National Gallery. The caricature in *Vanity Fair* by T. GIBSON BOWLES of "The Apostle of the Flesh"

is reported by the author to give a truer interpretation of this bewhiskered sporting parson, " as great a talker as any man in England."

CHARLES A. KOFOID

Samuel Wood Geiser. — *Naturalists of the Frontier.* With a foreword by HERBERT SPENCER JENNINGS. 341 p., portrait, (10) figs. in text. Dallas, Texas; Southern Methodist University Press, 1937. Price $3.00.

The frontier as here discussed is that of the Southwest, mainly Texas, and the period covered is that of exploration and settlement, principally from 1820 to 1880. The naturalists included number ten, although the appendix adds with brief biographical notes 143 others, who explored or collected within the boundaries of Texas. These ten represent very different interests; they worked at different but often overlapping periods and explored, in the main, different regions of the state. They all shared a common interest in nature and all had the devotion, sustained interest, skill, and perspective of values and relations which insured their success as competent observers and collectors. They all knew enough of the aims and methods of the natural sciences to establish and maintain connections with eminent botanists, entomologists, zoologists, or palaeontologists, who utilized their collections in research upon the fauna and flora of this great and varied area of the Southwest.

These men did their field work largely in very real isolation, physical, social, and intellectual, without adequate equipment or protection against thieving and marauding Indians, inclemencies of storm and floods, and hardships of the wilds without roads and shelter. Even more inhospitable was the intellectual desert with its scorn and ridicule of the bone-digger, herb-gatherer, or bug-catcher. Even the scientists who profited by their labors were dilatory in remittances and correspondence and sometimes in recognition of their contributions to the published records of their findings. All too often their calls for much needed supplies, equipment, and literature were unheeded. Still they labored on with the result that their collections and records are now to be found in the great herbaria and museums of the United States and of Europe and their names are preserved, again and again, in the nomenclature of the plants and animals of the Southwest.

JACOB BOLL, a Swiss apothecary, friend of LOUIS AGASSIZ at Neuchâtel, student at Zürich and Jena, came to Cambridge in 1869 and was sent to Texas to collect for the Museum of Comparative Zoology. Later he joined the curatorial staff of the Museum, for which he had collected 15,000 insects in Texas. Here he worked with H. A. HAGEN, the entomologist. After AGASSIZ' death, he returned to Dallas, Texas in 1874

and for six years worked as a field naturalist, exploring the mineral and fossil resources of north central parts of the state. He was about to be appointed director of a projected state geological survey at the time of his tragic death on his last expedition. He was a keen naturalist, rearing his Lepidoptera from the caterpillar stage; a skilled collector, meticulous about his field records; and a fossil scout of exceptional ability. He supplied COPE, the vertebrate palaeontologist, not only with recent reptiles, amphibia, and fishes, but with the fossil species from the Permian of Texas, some of them of great evolutionary significance.

JEAN LOUIS BERLANDIER collected in southeast Texas from 1828 to 1834 while attached to the Mexican Military Boundary Commission. He was sent from Geneva to Mexico by his teacher, the elder DECANDOLLE subsidized to collect plants for his master's projected *Prodromus*. He became the scapegoat of botanical exploration in the Southwest because of the poor condition of his collections and DECANDOLLE complained in print of his derelictions. This young and inexperienced explorer was a none-too-welcome hanger-on of an ill equipped military outfit with pack mule transport over a wild country without adequate scientific outfit, harassed by rain and floods and stricken with malaria. Our biographer takes considerable pains to establish the true extent of BERLANDIER's actual contributions to the first scientific knowledge of the flora of Texas and concludes that the comfortably situated professor at Geneva had no concept of the difficulties to be overcome and the real greatness of BERLANDIER's accomplishments as a botanical explorer.

THOMAS DRUMMOND was a Scot, brother of the Director of the Botanical Garden at Cork, Associate of the Linnean Society of London, member of Sir JOHN FRANKLIN's Second Overland Expedition in Canada, in which he was associated with the naturalist, RICHARDSON, and with Lieutenant BACK. He later explored the Missouri region and the southern United States and came to Texas in 1833, leaving for Cuba in 1834. Five of his letters to Sir WILLIAM J. HOOKER, his patron, are extant. They reveal his enthusiasm for the Texan scene and his devotion to his task. His travels in southeast Texas coincided with the devastations of the great cholera epidemic, the year of The Great Overflow, and a period of great international tension between English and American settlers and the Mexican authorities. Nevertheless he sent back to England 750 species of plants, sets of which were widely distributed, as well as considerable collections of vertebrates and invertebrates.

LOUIS CACHAND ERVENDBERG was Protestant pastor of the German settlement at New Braunfels, founder of an ill-starred liberal university, head of the home which he started to care for the unfortunate orphans of the incoming immigrants smitten by cholera, and collector for and

correspondent of ASA GRAY, the botanist, of Harvard College. He collected extensively from 1839 to 1855 in south central Texas and later in Mexico where he established a botanical experiment station.

German emigration to Texas was extensive and afforded a cultural background more sympathetic to science than that of the ruder, more practical frontiersmen of American origin. In 1834 FERDINAND JAKOB LINDHEIMER came to Belleville, Illinois, where he met his old friend, GEORGE ENGELMANN, the botanist, and the HILGARDS. Later he went to Mexico where he collected extensively but left to join a volunteer company formed at Mobile to fight for Texan freedom, a natural continuation of his liberal activities in his school days at Frankfort and Bonn. Later (1840) he carried on botanical work at St. Louis with ENGELMANN, who interested ASA GRAY in LINDHEIMER as a collector of Texan flora. He continued to collect for ENGELMANN (later of the Shaw Gardens of St. Louis) and GRAY till 1851 when he became editor of the *Neu-Braunfelser Zeitung* which he conducted for many years as a journal of broad cultural standards.

Still another German scholar, FERDINAND VON ROEMER, "the father of the geology of Texas", graduate of Göttingen and Berlin, pupil of BRONN, the geologist, and EWALD, the palaeontologist, is to be added to the list of Texan naturalists. He came at the instigation of the Adelsverein, an organization fostering emigration to Texas, to assist in developing the mineral riches of the German colony. His stay of eighteen months resulted in his classic on the Cretaceous formations of Texas.

American universities are represented in the list of Texan naturalists by the most eminent of all—CHARLES WRIGHT, Yale, 1835, educator, botanist, and *fidus Achates* for Dr. ASA GRAY of Harvard College. He carried on the finest scientific field work done in Texas. He collected from 1837 to 1852 across central Texas. GRAY's *Plantae Wrightianae* and the *Botany of the Mexican Boundary Survey* reveal his discovery of many hundreds of new species of plants. He was also the botanist of RINGGOLD's North Pacific Exploring Expedition. To his painstaking, intelligent, and careful collecting much of our knowledge of the flora of Texas is due. His letters to GRAY constitute a valuable scientific record as well as a shrewd picture of social conditions and of an explorer's difficulties.

The frontier itself contributed but one naturalist to the list, GIDEON LINCECUM, self-trained physician and naturalist, correspondent of many American scientists and even of CHARLES DARWIN, student of the habits of the agricultural ant of Texas, and collector of the plants and animals of east central Texas. His collections were sent to the Smithsonian Institution. His writings on the behavior of the agricultural ant had a

naïvete which called down upon him the scepticism of FOREL. But he was an observer of ability and a lover of nature, who under great handicaps accomplished much.

JULIEN REVERCHON came to Texas as a lad in 1856, a member of the French Fourieristic colony at La Réunion. At his death in 1905 he left an herbarium of 2,600 species, now at the Missouri Botanical Gardens. His explorations were limited to central Texas.

The most exotic of all the ten naturalists is GUSTAF W. BELFRAGE, the poverty-stricken descendant of a Swedish noble family, a victim of alcoholism, an entomological collector who worked intensively in north central Texas from 1867 to 1882. He contributed extensively to collections in the larger museums of the world and was a correspondent of the leading entomologists of America and Europe.

This book is a unique contribution to the local history of the growth of interest in the natural sciences and scientific exploration in the Southwest. It is a well documented book, written with a keen appreciation of the local scenes in which science struggled for a recognized place in the life of a frontier peculiarly Anglo-Saxon in its cultural make up, unique in its environmental relations, and varied in pattern. The author's scholarship and literary skill add to the attractiveness of the book. Except for an incipient antagonism towards ASA GRAY the author's presentations are marked by breadth of view and fairness.

CHARLES A. KOFOID.

Abraham I. Katsh.—EINSTEIN's *Theory of Relativity*. Portrait of EINSTEIN in frontispiece, 60 p. plus 20 p. of appendix, glossary and index. In Hebrew. Tel-Aviv, Palestine, 1936.

In recent years there has been a multilingual rash of popular accounts of Relativity (1). It is unfortunately true that many of them are by authors whose knowledge of the subject is superficial. The author of this work, for example, repeatedly elaborates the idea that NEWTON's theory and EINSTEIN's are mutually exclusive. Nowhere does he even hint that the former theory can be simply derived as a first approximation of the latter. In the section labeled "The Principle of Equivalence" there is no mention whatsoever of the principle, of which the author seems to have only the vaguest idea, and it is not till the summary at the end of the chapter that a two-line quotation from EDDINGTON gives the reader any notion of what the Principle of Equivalence is. Nor has the author been particularly fortunate in his choice of analogies.

(1) One of the most remarkable being the Japanese account by AYAO KUWAKI (Tokyo 1934; *Isis* 25, 556).

As an instance, the compression of a ball upon hitting an obstacle is not one of the better analogies for the LORENTZ contraction. Furthermore, the author minimizes the importance of the applications of Relativity to such an extent that he fails to mention, even in passing, the important role played by the relativistic spin of the electron in modern atomic theory. It is even more unfortunate that in his biography of EINSTEIN the author leaves the definite impression that EINSTEIN received the Nobel prize for his work on Relativity, and no mention whatsoever is made of the work on photoelectricity for which the prize was actually awarded.

It is always a difficult thing to translate technical terms into another language since the process often necessarily involves giving new connotations to old words and the coining of new words. The author very sensibly supplied a glossary at the end of the volume giving the English equivalents of the Hebrew terms he has chosen to employ. There are several terms which may be quibbled over, but it is unfortunate that there are so many which are inexcusable. Gravitation, for example, is translated as *koved*, meaning weight or mass. The author himself apparently realizes that this is not the appropriate word, for at the end of his chapter on the Gravitational Field he is reduced to transliterating ' gravitation ' into Hebrew—which is what he should have done at the start. The word *magen* (shield) is used for target, when the perfectly good term *mattara*, meaning precisely target, could have been found in any dictionary. The word parallel is simply transliterated although the standard Hebrew word *makbil* means just that. It is even more unfortunate that wave-length has been simply translated by the word *gall* (wave); nor was there any need to label two of the more important diagrams with Roman letters, while the others are labeled with Hebrew letters. Similarly, it was not necessary to use Roman letters in the text to represent velocity, mass, etc., since this is a popular, not a scientific, work.

The book, as a whole, is readable but it is so highly compressed that it is doubtful whether a layman, completely ignorant of modern physics, could hope to get any clear idea of the subject by reading it. It is unfortunate that the author did not take more pains with the work if he really felt that it was worth publishing.

(*Harvard Observatory*). DANIEL NORMAN.

G. Carl Huber.—*Memorial Volume*. Journal of Comparative Neurology, 65, 1+711, index, 173 fig., portrait, and bibliography, 1936. Price $ 7.50.

GOTTHELF CARL HUBER (1865-1934), M. D. (University of Michigan,

1887), Sc. D. (Hon.) (Northwestern University, 1930) was born in Hoogly, India, the son of Swiss missionaries. At graduation he was appointed Demonstrator in Anatomy and served his Alma Mater during the remaining forty-seven years of his life, being elected in 1903 Professor of Histology and Embryology, and Director of the Histological Laboratory. In 1914 he became Professor of Anatomy and Director of the Anatomical Laboratories. On leave in 1911-1912, he served as Professor of Embryology at the Wistar Institute. He held important advisory and administrative posts in the Wistar Institute, the Medical Fellowship Board of the National Research Council, and the Graduate School of the University of Michigan. He was Managing Editor of the *Anatomical Record* (1909-1920) and a member of the Editorial Board of the *American Journal of Anatomy* (1901-1920).

He was editor of the English translation of BÖHM and DAVIDOFF's *Histology*; of PIERSOL's *Anatomy*; and collaborator in the revision and translation of KAPPERS' *Comparative Anatomy of the Nervous System of Vertebrates*. His bibliography includes ninety titles in the fields of descriptive and comparative histology and neurology and in mammalian embryology.

His neurological work early made him the "greatest expert" on the histology of the sympathetic nervous system, recognized by the invitation to report on this subject at the 17th International Congress of Medicine (1913) in London. His studies, now generally accepted, on the development and structure of kidney tubules and on the origin of the blood supply of the medulla of the kidney, corrected long-standing errors. His work in this field is of significance in physiology and medicine. His experimental work on regeneration of severed nerves and his refined researches of their minute structure have been of the greatest value in the surgery of the peripheral nerves.

He was a hard worker, a thorough teacher, who instilled the highest standards into his pupils, an investigator of marked thoroughness and critical acumen, and a scientific administrator of widely recognized ability.

CHARLES A. KOFOID.

Archibald Malloch. — *Short Years. The Life and Letters of John Bruce MacCullum, M. D.* Pag. xx + 343 p., Chicago : Normandie House, 1937, ($ 3.50).

JOHN BRUCE MACCULLUM (1876-1906) while a medical student at Johns Hopkins carried out an investigation into the developmental anatomy of heart muscle which, published when he was twenty-one years old, brought him the recognition and admiration of others beside his

immediate teachers. It was clear from the start to everyone with whom MACCULLUM came into contact that here was no ordinary student. In addition to his intellectual qualities MACCULLUM's personality was so many-faceted and attractive that it left an unforgettable impression upon all who knew him. It is good therefore that Dr. MALLOCH, who as a boy knew and loved MACCULLUM, was moved to make the personality of his boyhood hero known to a wider circle.

In a letter written three years before his death MACCULLUM expresses himself in these words : "I think after all it is the power of appreciation & of understanding that is worth while in life. It is being able to put yourself in another's place & in a moment having his points of view. If one could do that he could influence people indefinitely. What is worth while is a big wide sympathy with other's feelings — a capacity for *understanding* in its widest sense. Don't you think so? I never noticed before I came here (Berkeley) how splendidly educated men can have absolutely none of such ability... " (p. 236). And this "big wide sympathy with other's feelings" is the characteristic quality of the letters which for the most part comprise this noble volume. MACCULLUM's tragic death from tuberculosis when not quite thirty years of age put an end to a life which though already rich in achievement promised great things. It is very sad.

As a memorial of MACCULLUM and as a picture of the evolution of a young scientist in the nineties Dr. MALLOCH's volume is greatly to be welcomed. The volume is altogether excellently produced. There is a bibliography of MACCULLUM's writings, and the volume is appropriately illustrated.

New York University. M. F. ASHLEY-MONTAGU.

D'Arcy Wentworth Thompson. — *A glossary of Greek birds.* A new edition. vii + 342 p., figs. (St. Andrews University publications, 39). Oxford University Press, 1936. (12s. 6 d.).

The author of this book, professor of natural history in St. Andrews, is the best example today of a man who has achieved considerable distinction as a classical philologist and as a naturalist. He is perhaps more generally known by his book on *Growth and form* (Cambridge University Press, 1917), of which a new edition is now in course of preparation. But he is also the editor of the *Historia animalium* of ARISTOTLE (in the Oxford English translation, vol. 4, 1910) and in 1929 he was elected President of the Classical Association, than which few honours can be more appreciated by an English-speaking man. I wonder whether any other naturalist ever received it. In 1895, the Cambridge University Press published his *Glossary of Greek birds*, a book of small

size (220 p.), but the value of which was immediately recognized. It has remained ever since the standard work on the subject, but being long out of print, a new edition was greatly desired.

This new edition is finally before us, one third larger than the first. The title of it is far too modest, in fact, misleading, for we are given not simply a glossary, a very rich glossary, but in addition a treasury of Greek quotations and of folklore (largely but not exclusively Greek) concerning the Greek birds.

In addition to the regular and obvious sources of philological and ornithological information, the author has made use of two others of great importance. First, the dialects of S. Italy, wherein a number of Greek words have been fossilized. Second, the Egyptian source. There was a time when every Greek word could be traced back only to a Sanskrit root. That time is past, we realize more and more clearly every day that the classical Greek language (like any language developing in contact with others) contained a good number of *Lehnwörter*, not only Persian words like *παράδεισος*, *σατράπης*, *παρασάγγης* or other oriental words, but also Egyptian words. These words are of special interest to the historian as they help to reveal the Egyptian influences to which the Greek-speaking people were submitted. Professor THOMPSON made full use of the Egyptian source; my only regret is that he did not add an Egyptian and other glossaries which would enable his readers to measure those foreign influences more easily.

The author's knowledge of the modern Greek language and folklore is very remarkable; it would be remarkable even for a professional Hellenist, for the majority of these have not yet realized the necessity of knowing modern Greek. To be sure his familiarity with Greek conditions is not comparable to that of a son of that heavenly country (how could it be?), and in his excellent and very favorable review published in *Nature* (vol. 139, 305-6) Dr. DEMETRIOS CACLAMANOS was able to point out a few mistakes. Mr. CACLAMANOS is not only one of the leading Greek diplomats but also one of the best exponents of English thought in Greek and of Greek thought in English. I beg leave to quote a few remarks from his review :

"The mention of the corresponding names in the modern Greek language is extremely accurate, except in a few cases, where Prof. D'ARCY THOMPSON has been led into error by foreign observers describing Greek birds. For example, the neutral in modern Greek does not use the terminal syllable *ον* of earlier forms, so that the modern name cannot be *ὀρτύκιον* or *παγώνιον* but is *ὀρτῦκι* and *παγῶνι*. HELDREICH, from whom the author quotes, was a naturalized German, and was influenced by the ancient grammatical forms, or he heard the names from Greek purists who thought it probably more elegant to use classical forms instead of the popular ones, especially when informing foreigners. Such lapses,

however, are rare and unimportant, and the correct forms are also mentioned by the author."

... "It is interesting to note that in spite of the popularity of the nightingale, sweethearts are never referred in Greek folk-songs as ἀηδόνι μου. This appellation applies, in a satirical mood, to prolix orators in the Agora or elsewhere. As for terms of endearment, comparisons used in the Greek folk-songs and even in daily life, are confined to partridges (περδικά μου), pigeons (περιστέρα μου) and turtle-doves (τρυγόνα μου). I must say, however, that the names of these birds in Greek have a poetical flavour unknown in the corresponding names in Western languages. Or am I influenced in this belief by the frequent use of the words in Greek folk-poetry?"

"Modern Greeks are not at all respectful of the sacred bird of the goddess patron of Athens, symbolizing her wisdom. Not only has the beautiful ancient word γλαύξ so strikingly reminiscent of the blue-eyed daughter of Zeus, been succeeded by the cacophonous κουκουβάγια evidently derived from the resemblance of the ululations of the owl to the call of the cuckoo (κοῦκκος) but also they consider a visit from the Athenian bird to the roof of a house, flying there from its usual haunts on the slopes of the Acropolis, as a definite ill-omen. Somebody will die in the house so visited, and the superstition, more widespread in Athens than elsewhere, is confirmed by striking coincidences."

Speaking of the owl, Prof. THOMPSON remarks that the Scandinavian name *ugla* suggests that the words γλαύξ and owl may derive from the same root. He reproduces the curious little owl which adorns an Athenian tetradrachm (the date of which, not given by him, is c. 490 B. C.) but I missed the older and very amusing terra cotta owl of the Louvre. See my wife's drawing of it. It dates from the seventh

century B. C.; is only 5 cm. high. The feathers of the wings are black and red, white dots being scattered over the neck and head (1).

(1) Many readers know that owl by sight without knowing anything about it, for a drawing of it is printed on the cover of every Greek classic issued in the collection of the French universities (Les belles lettres, Paris). It was first described by E. POTTIER : La chouette d'Athéné in the *Bulletin de correspondance hellénique* (vol. 32, 529-48, 2 pl., 1908).

This suggests my main criticism of the book. The iconographical part is not at all on the level of the literary part. The illustrations should have been more numerous and more pertinent. A dozen figures are borrowed from Egyptian documents, while I could find only seven derived from Greek sources (six of them from coins). Now the Egyptian words embedded in the Greek language are very important indeed, but Egyptian illustrations of Egyptian birds are not quite relevant. After all, Egypt and Greece are two very different countries and I assume that they do not boast quite the same birds. Miss GISELA M. RICHTER's fine book on *Animals in Greek sculpture* (Metropolitan Museum 1930) would have helped the author to improve his iconography. That book contains no less than 30 bird documents (FIG. 187-217).

Surely many birds are common to the Eastern Mediterranean countries, and I got my first glimpse of a free hoopoe (*Upupa epops*, ἔποψ) not in Greece but in Egypt (in Luxor), just as I became acquainted with him through Arabic, not Greek, literature. By the way, the usual Arabic name is none of those given by the author (p. 99), but *hudhud*. The *hudhud* is a very pleasant bird to look at from a distance, and I was glad to recognize him in the frontispiece.

This lovely book which represents the work of a lifetime will always be associated with the author's name — D'ARCY THOMPSON on Greek birds! — and I hope that some day we shall be given a properly illustrated edition of it.

GEORGE SARTON.

Loren C. MacKinney.—*Early medieval medicine with special reference to France and Chartres.* Publications of the Institute of the history of medicine, the Johns Hopkins University, third series, vol. III, 245 p., portrait. Baltimore, Johns Hopkins Press, 1937.

This scholarly work of three chapters represents the Hideyo Noguchi Lectures given by Professor MACKINNEY at the Institute of the history of medicine, Johns Hopkins University, in 1936. The author deals not so much with the technical aspects of medicine in the early middle ages as with a discussion of its connection with the general development of the first stages of western civilization. Medicine in the middle ages was not the highly specialized science that it is to-day, much of it was studied and practiced by non-professional laymen and by clergymen. It was a subject often studied by students who were primarily interested in philosophy, theology, law, etc., and books on medical subjects were written by many of these men. Thus it is impossible to study the history of medieval learning and the spread of ideas without taking into consideration the study of the development of medical ideas.

Too many doctors, and even some historians, think that the middle ages were entirely " dark " and that nothing can be gained by a study of the scientific ideas of the medieval medical writer. This is mainly due to the fact that too many present-day writers are still depending on the material to be found in biographical dictionaries and out-of-date historical works instead of carefully examining the original sources. In the first lecture the author quotes numerous passages from nineteenth and twentieth century writers to show the gradual change from this outmoded point of view, and the slow acceptance of a fairer criticism of medieval medicine.

In the early period of the middle ages there were two different types of medical practice, the supernatural and human. Supernatural healing comprised the use of saintly relics, Christian and pagan charms and incantations. These methods of healing were usually found in the works of the Church Fathers. Human healing was accomplished by the use of drugs, minor surgery and diet. But as early as the time of BEDE (c. 673-735) the supernatural methods were beginning to give place to the human, even in the works of conservative clergymen. Although most of the medical writings that have come down to us from the early middle ages were composed by either regular or secular clergymen, new evidence points to the fact that there was a considerable number of trained laymen employed as public and royal physicians.

In the second lecture the author discusses the state of medical knowledge in France in the Merovingian and Carolingian periods. In the first period new evidence shows that there were still a considerable number of lay physicians and that medicine was not based exclusively on charms and relics, but on classical authorities, and to a lesser degree on practical experience. In the Carolingian period medical methods begin to change, more emphasis is placed on human medicine and less on superstition, and there is a greater reliance on classical works. Medical education now begins to be a part of the regular course for all clergymen and monastic medicine is supreme, lay physicians being few and inconspicuous. The third lecture deals with the progress of medicine in the cathedral school at Chartres in the tenth and eleventh centuries, Chartres being one of the most important medical centers in the north.

The material included in this work shows that the author's conclusions are based on a vast amount of real research and that he has succeeded in finding a great many new facts which have previously been ignored by writers on the history of medicine in the middle ages. Valuable quotations from the sources are included, and very complete references to original sources and good secondary works. It is the type of book

that should do a great deal to point the way to better methods to be used in investigating the true history of medieval learning.

Cambridge, Mass. MARY CATHERINE WELBORN.

Lynn Thorndike ; Pearl Kibre.—*A catalogue of incipits of mediaeval scientific writings in Latin.* XVI+926 p. The Mediaeval Academy of America, Cambridge, Massachusetts, 1937. ($ 12.00 ; $ 9.60 to members of the Academy).

This catalogue of incipits of scientific works, containing over 10,000 items, is a very precious contribution to the study of the history of science in the middle ages. So far A. G. LITTLE's *Initia operum latinorum quae saeculis XIII, XIV, XV attribuuntur*, has been the only collection of incipits available to medievalists. LITTLE's work, although valuable, is now out of print and is also inadequate for historians of science because it includes only about 6,000 citations many of which are not on scientific subjects. However, all the scientific writings cited by LITTLE have been included in this new *Catalogue* which deals primarily with medieval scientific works either written originally in Latin, or medieval Latin translations of other treatises. Most of the works mentioned are on medical, occult, mathematical, and natural sciences written before 1500, but a few others have been included, such as non-scientific works of an author whose scientific writings are listed, and other treatises whose strict classifications cannot be clearly determined by the incipit but which seem to be connected with some scientific subject. Below the incipits are listed the names of the authors, the titles of the work, and if they are translations, the names of the translators, as well as various manuscript numbers and printed editions.

In the preface, the readers are warned that the manuscripts cited after each incipit are not always the earliest or the best ; in a great many cases no manuscript number is given but a printed edition is listed if possible ; for instance, for GROSSETESTE's *Compotus* two manuscript numbers are indicated as well as the edition by STEELE, but in the case of ROGER BACON's work on the same subject only STEELE's edition is cited.

Professor THORNDIKE and Dr. KIBRE have taken their incipits from a great number of manuscript catalogues, bibliographies, scientific journals, literary histories, contemporary writings, etc., and have then verified them in both American and European libraries. They have not only been very careful in identifying the incipits themselves and the manuscript copies and later editions of these works, but in assigning works to the proper author. For instance, they were not led astray by Dr. CHARLES SINGER's statement in the *Fasciculo di medicina* (I, 34),

a work printed as late as 1925, that MUNDINUS DE LENCIIS wrote only the *Anathomia*, but have listed five other works written by this fourteenth century medical man. Evidently this *Catalogue* is even more trustworthy than the introductions to some modern editions of medieval works.

At the end of the *Catalogue* is an extremely valuable index listing the names of the authors whose works are cited in the text, and a list of the titles of their works with page references to the incipits. Another index grouping the various works under their different subject headings would have been an important addition to their book.

Far too many writers are still depending on secondary works for their knowledge of the history of science, so it is to be hoped that this list of incipits will encourage them to refer more often to the manuscripts and printed original sources. This book will certainly be very helpful to anyone wishing to identify obscure works. And it is to be sincerely hoped that Professor THORNDIKE's desire " that this volume may prove to be the prolegomena to that Corpus of mediaeval scientific writings in Latin which should be one of the immediate concerns of both humanistic and scientific historical scholarship", will be fulfilled. (For further details of the plan for this Corpus see his articles in *Isis* XIV, 368-384 ; XVI, 447). Professor THORNDIKE has already done a great deal to point out little known manuscript material in his other books and articles and this *Catalogue of incipits* will be an excellent companion volume to his *Magic and experimental science*.

Cambridge, Mass. MARY CATHERINE WELBORN.

Loyd Haberly. — *Mediaeval English Pavingtiles.* 327 p. Oxford : BASIL BLACKWELL, 1937, (£4-4-0).

From every point of view this is a beautiful book. In the first place it deals with a subject aesthetically pleasing in itself. In the second place, it is beautifully written by an authority who has made the subject his own; and in the third place, the book has been beautifully designed and printed by the Shakespeare Head Press. The collection of tiles have all been reproduced in red to a uniform scale from the drawings made by Mr. HABERLY; drawings which are very clearly faithful reproductions of the originals.

All the examples of mediaeval pavingtiles reproduced in this volume were gathered within a radius of 15 miles of Oxford; so that there still remains much work for pavingtile fanciers to do elsewhere in England.

Mr. HABERLY contributes a rather general essay on the art of the mediaeval pavingtile maker, and supplies the details of the legends describing the examples figured.

The history of the art of the tile maker has yet to be written, and when it comes to be written Mr. HABERLY's volume will prove a valuable source upon which to draw for the Oxford area. But as Mr. HABERLY urges, it is greatly desirable that others having the opportunity should record examples of early pavingtiles in their own localities.

A large number of the tiles reproduced in Mr. HABERLY's book are obviously of a very ancient lineage. Familiar Eastern motives abound; the sheep, the ram, the lion, and the kingly hunt, not to mention more formal compositions; but in these connections Mr. HABERLY has nothing to say. The study of comparative tegulology is, no doubt, for the future; it is, however, time that a start were made. Incidentally, it is good to notice that SHARMAN's *A Cursory History of Swearing* is still remembered and consulted. I suggest that the offer of a prize for the solution of the inscriptions on tiles XL and XLI might produce interesting results. There is an excellent bibliography and a good index.

New York University. M. F. ASHLEY-MONTAGU.

Medieval and Historiographical Studies in Honor of JAMES WESTFALL THOMPSON. — Edited by JAMES LEA CATE and EUGENE N. ANDERSON. x+199 p., portr. The Univ. of Chicago Press, 1938.

This handsomely printed volume, of which even the jacket is dignified and commendable, constitutes a worthy memorial to the genial personality and forceful teacher and writer of history in whose honor it is issued. Five hundred pages are filled by a dozen essays in the field of medieval history and by five on historiography by as many different authors. All the contributions are fully annotated and documented in many languages. Varied are the fields of medieval civilization of which these essays treat : church history and hagiology, pilgrimage and Holy Roman Empire, German and Italian towns, market reform and commission merchants, art and antiquities. The two of closest interest to students of the history of science are in the field of medieval medicine : that of L. C. MACKINNEY on "Medieval Medical Dictionaries and Glossaries", and Miss WELBORN's "Study in Fourteenth-Century Medical Deontology". Your reviewer had to look up the last quoted word in a dictionary and would have preferred "Ethics". The treatments of such individuals as MEINECKE, JUSTUS MÖSER, KAUTSKY, THEODORE ROOSEVELT, and even ST. BIRGITTA of Sweden and BERNWARD of Hildesheim are also not without interest to the history of science, thought and civilization. A Bibliography of the Works of JAMES WESTFALL THOMPSON completes the volume. A photograph of Professor THOMPSON forms the frontispiece.

Slips in proofreading and the spelling of words from foreign languages

seem confined to a single contribution, unfortunately that on Medical Dictionaries and Glossaries. Here in note 8 on page 245 *nubio* should be *nube* or *nubibus*, and *allorum* should be *aliorum*. In the quotation on p. 246 *florum medicinae* should be *Flos* or *Flores medicinae*. In note 23 on p. 250 the genitive *Dioscoridis* is called for instead of the nominative *Dioscorides*. In the last line on p. 257 *herbarum aromaticorum* should be *herbarum aromaticarum*. In the third line of the notes on p. 260 MS should be MSS. In note 62 on p. 263 *emmoroidas* and *gonoria* do not seem right. But worst of all is "Jacobus de Dondus of Padua" instead of JACOBUS DE DONDIS on p. 249, especially since he is thereafter called "Dondus" (twice on p. 249 and again on p. 268).

An index would have enhanced the value of this volume, which contains many detailed footnotes, bibliographical references, proper names and technical terms.

Columbia University. LYNN THORNDIKE.

Reginald Hugh Kiernan.—*The unveiling of Arabia.* The story of Arabian travel and discovery. 360 p., 31 illus., 13 maps. London, HARRAP, 1937.

Christina Phelps Grant.—*The Syrian desert.* Caravans, travel and exploration. xv+410 p., 16 pl., 4 maps. London, BLACK, 1937.

It is proper to review these two volumes together because their subjects overlap and because they belong to the same class of semi-scholarly books written for the general reader. This does not mean that scholars should despise them; that would be equally wrong and foolish. Scholars should take full advantage of them and if they did so with due caution they would find these books very useful indeed.

Mr. KIERNAN's purpose is sufficiently well explained in the first paragraph of his preface.

> "Arabia and its inhabitants were not revealed to the West by a systematic process of discovery, each explorer adding to the work of his forerunner. Information was gained, forgotten or lost, and later recovered and supplemented; it was a haphazard process, effected under conditions of danger from nature and mankind by a long series of greatly varied personalities, who seem to have had but two qualities in common—curiosity and courage. I have tried not simply to summarize their work and, as HOGARTH did so ably a generation ago, attempt the solution of geographical problems. Most of the knots have now been unravelled or boldly cut. Here the attempt is to link the story of exploration to the history of the land and show something of Arabia as the great explorers saw it. To avoid repetition, where they covered the same ground I have concentrated the account on the thing each did best, as, for instance, BURCKHARDT showed Mecca, the Meccans, and all the great streams of pilgrimage; the precise "ALI Bey" the temple at Mecca; while BURTON is given most space on his way to the Hejaz and at Medina, where BURCKHARDT was too ill to exercise his

normal thoroughness. In this way, I hope, a varied picture has been drawn of Arabia and Arabian travel throughout the ages, with an assessment of results and their comparative value."

I must admit that his well written book does not displace from my mind *The penetration of Arabia* of DAVID GEORGE HOGARTH (1904), which when I read it many years ago made a deep impression upon me, but it has at least this advantage over the older book that it contains an account of the very remarkable discoveries which occurred within our own century. It will suffice to recall the names of Captain W. H. I. SHAKESPEAR, GERTRUDE BELL, Captain G. E. LEACHMAN, DOUGLAS CARRUTHERS, Major R. E. CHEESMAN, ELDON RUTTER, A. J. WAVELL, G. WYMAN BURY, T. E. LAWRENCE, FREYA STARK. Moreover our century has added a new chapter to the history of Arabic exploration, the discovery of the "Empty Quarter" (ar-rub' al-khâlî) which was brilliantly accomplished in 1930 by BERTRAM THOMAS, sometime vizier of the sultan of Oman, and again in the following year by H. ST. J. PHILBY (Sheikh 'ABDALLAH). It was my privilege to discuss these great events with BERTRAM THOMAS himself when he visited Harvard University in February 1935.

These thrilling stories are briefly but well told by the author, and his book is sufficiently well indexed to be useful for reference.

Mrs. GRANT's book is more pretentious. It is divided into nine chapters as follows : I. The Syrian Desert and its inhabitants ; II. Channels of ancient and medieval trade ; III. Travellers and explorers of the Syrian Desert ; IV. The merchant caravans ; V. Eighteenth-century travel across the desert ; VI. Private caravans of the great desert route ; VII. The great "Hajj" caravans ; VIII. Eleven centuries of postal service ; IX. The era of mechanical transport. The last chapter is the newest ; that is, it contains abundant information not available in book form before. This book will be read with special pleasure by the growing class of people who have crossed the desert from Damascus to Baghdâd, or have lived (or are living) in its neighborhood. The illustrations are well chosen and the author has taken considerable pains to tell this very complex story as completely and as well as possible.

Her long winded note on Arabic transliteration made a very bad impression upon me. It is a disingenuous excuse to cover up her ignorance or laziness. Indeed all the Arabic words quoted by her occur in Arabic script, and can easily be found in Arabic books and dictionaries. These Arabic written words could be easily transliterated in a consistent way, see the *Encyclopaedia of Islam*, or *Isis* 6, 410-12, or my *Introduction* (vol. 1, 46 ; 2, 101). The fact that these words are pronounced differently by different tribes is irrelevant in a book not concerned with dialectical

peculiarities. Think of the chaos which would result if the same method (or lack of method) were applied to other countries, e. g., to Russia or Greece, or even to England, and if foreign words were written anyhow because their pronunciation was not absolutely fixed! The author's glossaries are childish.

This is severe criticism, but I must make it not only because of this particular book (in many ways a valuable one) but for a more general purpose. People writing about Arabic or Islamic subjects should take the trouble of studying at least the rudiments of Arabic or enlist the cooperation of an Arabist. If they don't, they condemn themselves to secondhandedness and mediocrity and can never be accepted as authorities. No one would have the same presumption with regard to subjects requiring a knowledge of Latin or Greek. The Arabic language must be respected in the same way and I am determined to defend it, and to defend the duties and rights of Arabic scholarship against every author who has the impudence of dealing with Arabic subjects without Arabic knowledge. GEORGE SARTON.

Meyer Waxman.—*A History of Jewish Literature.* 3 vols., Vol. I, xvi+501 pp.; Vol. II, X+698 pp.; Vol. III, XII+797 pp. ($ 11.50). BLOCH Publishing Co., New York, 1930-36.

Jewish literature must not be identified with Hebrew literature. The Jewish literature is polyglott, it is written in Hebrew and Aramaic, in Greek and Arabic, in German and English, and in many other languages. S. DUBNOW calls his history of the Jews *A World's History of the Jewish People*, and WAXMAN would be justified in naming his book *A History of the World's Literature of the Jews.* Almost 2000 years ago the geographer STRABO cried out about the Jews that " it is hard to find a place in the habitable earth that has not admitted this tribe of men and is not possessed by it." Nowadays it would be almost hard to find a civilized language in which there is not more or less of a Jewish literature. Very early, while still in Palestine, the Jews gave up their national Hebrew language. When, with the Restoration of Ezra at 450 B. C., Jewish religion became a living religion, firmly entrenched in life, Hebrew became a dead and holy language, and the Diaspora was recognized as one of the normal conditions of life for the Jewish people. When, in the 19th century, religion was on the way of becoming dead and a holy relic, there set in the revival of Hebrew and of the nationalist longings of the Jews for their Palestine and the Jewish state.

It is obviously much more difficult to write the history of a polyglott literature than that of a national literature. And more than that, the scope of this book is not limited to poetry and *belles lettres*, but it is of

a broad encyclopaedic character, comprehending all the branches of human knowledge and learning. The author of such a history of literature had to make himself familiar with the history of law and religion, of science and theology, of philosophy and mysticism. The rich variety and wide ramifications of the literature discussed in these three volumes may be gauged from a short survey of the contents.

It was the author's plan to exclude the Biblical period and to discuss only the postbiblical literature reaching from the close of the Bible-Canon to our own days. The first volume, comprising 14 chapters on the literature from c. 400 B. C. to c. 1200, begins with the Apocrypha and the Hellenistic literature of the Greek-speaking Jews and continues with the Greek, Aramaic and Arabic Bible translations, with the origin and development of the Mishnah, Midrash and Talmud, with the whole range of the Gaonic, Rabbinic and Karaite literature, with philosophy and mysticism, with Massorah, grammar, lexicography and Bible exegesis, with the various branches of science and history, and with literature proper, in prose and poetry. The second volume, dealing with the period from 1200-1750 in 12 chapters, discusses the further development of Bible exegesis, grammar and lexicography, of commentaries, codes and responsa in the Rabbinic literature, of philosophy and poetry, theology and ethics, history, Cabbala and the sciences, of the Karaite literature, and of the Judaeo-German literature, the forerunner of the modern Yiddish. Finally, in the 14 chapters of Volume III a thorough treatment is accorded to the great movements of Hassidism, constituting a kind of reactionary mysticism, (1) and Haskalah (progressive enlightment), of Reform and Neo-Orthodoxy. Special emphasis is also laid upon the detailed description of the rise of modern Jewish learning, the so-called Science of Judaism, devoted to the investigation of Jewish life and thought in the light of the modern methods of philological and historical criticism. The author's greatest interest is awakened when he comes to the phase of the revival of Hebrew literature, so intimately connected with the rise of the Haskalah. This appears from the relatively excessive amount of space apportioned to this new movement. Thus, vol. I, comprising 500 pages, treats of a period extending over 16 centuries, from c. 400 B. C. to 1200 of our era; the second vol., with c. 700 pages, is devoted to the literature produced in the time from 1200 to 1750; while the relatively short period of 130 years, from 1750 to 1880, occupies the whole third volume with

(1) WAXMAN, however, seems inclined to adopt the mystic nationalist viewpoint, which hails Hassidism as a " a reform tendency, as a reaction against rigid and barren Rabbinism, as a movement which stimulated new interests in Jewish life and tinged it with a poetic spirit "; see vol. III, p. 18.

c. 800 pages. This somewhat misproportioned allotment of space shows where the special literary interests of the author lie and where the sympathies of the public, to whom he addresses his book, are supposed to lie.

WAXMAN's work represents the third attempt to write a comprehensive history of Jewish literature (2). His two predecessors are MORITZ STEINSCHNEIDER (1816-1907) and GUSTAV KARPELES (1848-1905). STEINSCHNEIDER, one of the founders of the Science of Judaism and one of the greatest bibliographers of the world, published his history of the Jewish literature in 1850 as an elaborate article for the German Encyclopaedia of ERSCH and GRUBER. Though necessarily appearing in the form of a short sketch and outline, it laid the sound foundation for the subject, and its most excellent chapters revealed for the first time the important contributions of the Jews in the Middle Ages to the history of the sciences, and thus disclosed where the main interests of STEINSCHNEIDER lay. These chapters aroused the attention of LORD WILLIAM SPOTTISWOOD, a distinguished English historian of mathematics, who was instrumental in the translation of the book into English in 1857. In the year 1900 the noted Jewish American scholar, Professor H. MALTER, a disciple of STEINSCHNEIDER, translated it into Hebrew. At the same time the brilliant German writer KARPELES published his history of Jewish literature in German, which covered the whole subject, including the Biblical literature, in 2 volumes. This work, too, was later translated into Hebrew by the eminent Hebrew author N. SOKOLOW, the late President of the World's Zionist Organization. WAXMAN's work does not boast of the great scientific merits of STEINSCHNEIDER's original research, nor does it lay claim to the fine qualities of the scintillating literary style of KARPELES. WAXMAN's style is an expository one, his scope and method are didactic. WAXMAN's purpose was to write a popular book for the large lay intelligent public, a work which may also serve as a school text or reference book for the higher schools of Jewish learning. Hence the notes were reduced to a minimum and the discussion of controversial questions was entirely omitted. Originally, WAXMAN intended to follow the example of KARPELES and to dispose of the whole history of Jewish literature, though with the exclusion of the Bible, in two volumes. In the course of his studies, however, he found himself compelled to alter his original plan and to devote a third volume to the literature of the modern times,

(2) It must be noted, however, that simultaneously with WAXMAN's work there appeared an excellent history of the Jewish literature in Yiddish by Dr. I. ZINBERG. So far, 7 volumes appeared, Vilna 1929-36, dealing with the period from *c.* 900 A. D. to the beginning of the 19th century.

beginning with 1750. But while working on his third volume he again realized the necessity of expanding his book still further, and he promises to add in the near future a fourth volume dealing with the extensive literature of the nationalist movement of the last 50-60 years, from 1880 to the present day. The author is to be congratulated on his great achievement and ambition. It is apparent that he grew with his work, in ambition as well as in the knowledge of the subject and in the mastery of the literary form. It is to be wished that, like the two previous histories of Jewish literature, his work, too, may soon find its Hebrew translator. Since the author himself is known to be a Hebrew writer of great ability and renown, we may perhaps hope to obtain an authoritative and much improved Hebrew reproduction of the book from his own hand.

SOLOMON GANDZ.

Salo W. Baron.—*A Social and Religious History of the Jews*, 3 volumes (sold separately); Vol. I, pp. xiv+377 ($ 3.75); Vol. II, pp. x+462 ($ 3.75); vol. III, pp. xii+406 ($ 4.00); Columbia University Press, New York City, 1937.

The Jews have an old and tragic history, but their historiography is rather poor and meagre. JOSEPHUS wrote in Greek and, until the modern times, was entirely ignored by the Jews. The Books of the Maccabees, telling the story of the most glorious epoch in Jewish history, belong to the Apocrypha, the kind of literature which was suppressed by the censure of the Synagogue. It was only by chance that they were preserved in their Greek translation. During the Middle Ages, lasting for the Jews until the end of the 18th century, the Jews produced almost nothing in the field of history, neglecting even their own history, so rich in wanderings and martyrdom. The rich historical literature of the ancient Hebrews, their poems and genealogies, annals and chronologies have been excluded from the Canon of the Bible and got lost. What remained of them are excerpts and extracts, rewritten and reedited with a theological purpose. The historical books of the Bible are not intended to give a history pure and simple, but a philosophy of history. Their aim is not story-telling, but to teach a lesson in religion.

Professor BARON's new book represents a notable enrichment of Jewish historiography. Not only are important and valuable contributions made to the subject, but we are getting a new outlook upon the course and development of Jewish history, a new method of approach and a new theory. Like the historical books of the Bible, BARON is not concerned with the story and narrative, but with the philosophy and interpretation of

Jewish history. BARON takes it for granted that the reader is well familiar with the body of facts, with the political events and literary achievements of Jewish history, from such standard works as have been written by H. GRAETZ and S. DUBNOW. As the title indicates, BARON's avowed plan was not to write a political and literary, but a social and religious history of the Jews. Moreover, he did not propose to give a thorough and systematic description of all the social institutions and religious creeds and commandments, as they arose and developed in the course of the 3000 years of Jewish history. What he undertook was to discuss some of the more important social and religious institutions from the particular point of view of their mutual interrelation and interdependence.

The work grew out of a series of ten SCHERMERHORN lectures, delivered at Columbia University in the Spring of 1931, under the title " Jewish Society and Religion in their Historical Interrelation." Though considerably amplified and elaborated, these lectures still form the nucleus of the book in its present shape, and the author is still primarily concerned with his original topic, which is to prove the interrelation of social and religious forces. As his predecessors in the same method of approach, BARON mentions WERNER SOMBART and MAX WEBER. The brilliant, but undisciplined, SOMBART wrote in the German language a work on " The Jews and Modern Capitalism," in which he tried to prove that the Jewish religion was instrumental in promoting the rise of modern capitalism. The more serious WEBER deals with the economic causes of the development of the ancient religion of Israel. BARON, however, makes an attempt to submit Jewish history in its totality to the same method of interpretation. The two first volumes contain the text in twelve chapters and an epilogue, while the third volume gives the notes, the bibliography and the index. Four major periods are distinguished, and to each period three large chapters are devoted. The first, introductory chapter, inscribed " Jewish Society and Religion", presents in a general outline the author's philosophical outlook. Chapters II-IV, under the titles: The Origins of Israel, Kings and Prophets, The Crucial Test, deal with ancient history down to the Restoration. The chapters V-VII have the captions: The Expansion of Judaism, The Great Schism, The World of the Talmud. They deal with the period reaching from ALEXANDER THE GREAT to MOHAMMED, and discuss the growth of the diaspora, the sectarian movement leading to the rise of Christianity and the consolidation of national and Talmudic Judaism in Palestine and Babylonia. The Middle Ages from the rise of Islam to the 17th century, are the topic of chapters VIII-X, treating of the life of the Jews in the Muslim and Christian countries. Finally, chapter XI. Emancipation; XII. Natio-

nalism, and the Epilogue are devoted to modern history and to the problems of the present day. It seems, however, that the arrangement of the chapters was not intended to be strictly chronological, as the author often chooses to discuss the total development of certain institutions and historical phases within the confines of one chapter. A great deal of the problems discussed in the text, receive their further substantiation in the elaborate notes of the third volume. Some of these notes are highly important, assuming almost the size and character of excursuses or short monographs. The more advanced student may perhaps find the main contribution of BARON's work to lie in these stimulating notes, which may lay the foundation for further extensive researches into the various aspects of the subject. Thus, to mention only a few of them, notes 4 on p. 24, 5 on pp. 33-34, 13 on pp. 50-51, and 32 on pp. 61-62, deal with the questions of population ; note 15 on pp. 51-53, with ancient Jewish art ; note 24 on p. 41, with Pharisaism ; notes 3 and 7 on pp. 46-48, with Roman legislation with regard to the Jews ; notes on pp. 54-60, with various sects including Christianity ; note 5, p. 131, with resettlement of Jews in the Balkans and in Western Europe ; notes 6-7, pp. 132-135, with Jewish contributions to the development of modern capitalism.

The research student will especially appreciate the extensive bibliographical references which were critically reviewed and classified in the notes. Professor BARON has made great efforts " to list the recent and less accessible publications which, as a rule, are not recorded in any of the larger works available to the student." Well over three-fourths of all the secondary literature mentioned in the bibliography was published in 1930 or later than that year. Let us hope that the author himself may find the leisure and strength to work out all this tremendous material collected and sifted in his notes to a new political and literary history of the Jewish people. SOLOMON GANDZ.

Judaism and Christianity. — Vol. I. *The age of transition.* Edited by W. O. E. OESTERLEY; XII + 304 pages. New York, The MACMILLAN Co. 1937. (Price $ 4.00). — Vol. II. *The contact of Pharisaism with other cultures.* Edited by H. LOEWE; XXII + 371 pages. London, The SHELDON Press; New York, The MACMILLAN Co. 1937. (Price $ 6.00).

It has been said that JOHANN GERHARD VOSSIUS (1577-1649), the famous Professor at the Athenaeum of Amsterdam since 1632, was one of the first European scholars to treat theological dogmas and the non-Christian religions from a purely historical point of view. In order to get access to the Hebrew and Rabbinic sources he cultivated

amicable relations with the equally renowned Jewish author of his time, Rabbi MANASSEH BEN ISRAEL. The latter was one of the Rabbis of the newly founded Jewish Community of Amsterdam which consisted almost exclusively of Marranos who had fled from the Inquisition in order to revert to the faith of their fathers. Ever since that time the discipline of theology and the scientific study of religions advanced in a zigzag line, making three steps forwards and two steps backwards.

The two volumes on *Judaism and Christianity* that have just appeared truly represent one great step forwards in the direction of an objective investigation of the historical connections between the mother- and daughter-religion, and also in the direction of a friendly collaboration between representative scholars of both faiths. The essays of vol. I grew out of a series of lectures which were delivered at Kings College, London, during the winter of 1935-36, while the second volume presents a course of addresses which were delivered at the so-called "Society of Jews and Christians" in Cambridge 1935-36 (1). As an introduction to the first volume, the general historical background is presented by the editor, Professor OESTERLEY, in a brief outline discussing the world history of the period from *c.* 300 B. C. to *c.* 100 A. D. In two admirable papers OESTERLEY then proceeds to depict the Wisdom Literature and the Apocalyptic Writings of the Jews, the first dating roughly from about 400 to 200 B. C. and the second from *c.* 200 B. C. to 100 A. D. We are getting a glimpse of the Jewish sage and seer addressing himself, by word of mouth, to the plain people of the street as their teacher and educator, and are thus prepared for a better understanding of the Gospels. In a fourth article OESTERLEY treats of the belief in angels and demons, a form of religion or superstition which can never be entirely eradicated from the life and thought of the masses. OESTERLEY, however, is confident that JESUS as the Healer of the sick did not regard sickness as an "obsession" or "possession" by demons or evil spirits. In his opinion such beliefs and practices are rather due to the compilers of the Gospels, who may have imputed them to JESUS. In the reviewer's humble opinion this means to stretch a critical method in order to suit a favorite idea or theory.

The essays of E. O. JAMES and S. H. HOOKE deal with the influence exerted by the Graeco-Roman world and by the Oriental mystery religions upon the development of early Christianity, and the largest article of the volume, expounding the ideas of Pharisaism, comes from the pen of Dr. H. LOEWE, a Hebrew scholar who obviously wishes to be regarded as the modern representative of Pharisaic Judaism. LOEWE makes great

(1) See preface to vol. I, and vol. II, p. 223.

efforts to prove that JESUS himself always was and remained a good Pharisaic Jew. He attacked certain abuses and denounced the hypocrites, but he came to fulfill the Law and not to destroy it. According to LOEWE, those parts of the Gospels which place JESUS in deliberate and conscious opposition to *fundamental* principles of Judaism are later partisan elements, while those parts which depict him as a saintly preacher, a devoted healer, a popular sage and speaker of parables, an heroic martyr, are genuine and worthy of our regard. The portrayal of JESUS as antagonistic to Law, as claiming to be God or a son of God, belong to a later period (*c.* 60-90 A. D.), when the mutual hostility between the two faiths was the keenest. It is during the period of the oral tradition of the Gospels that these changes in the descriptions of JESUS' character took definite shape.

So far LOEWE's argument. In the reviewer's opinion, however, this theory fails to account for the bitter hostility of the Sanhedrin. There must have been some weighty reasons which prompted the Sanhedrin to convene on a holiday, to convict the popular preacher and to surrender him to the Roman authorities for a cruel punishment. Here again, the reviewer must see an attempt to use the method of "Higher Criticism" for the advancement of a "highly uncritical" conception. LOEWE, however, is so fond of this favorite theory of his that, as the editor of the second volume, he is using the term Pharisaism in the title in the unusual sense of denoting a body of ideas which is supposed to have become the common heritage of Judaism and Christianity alike. As a result, his papers on Pharisaism must necessarily fail to present the essential features of the religious sect. Tacitly, this strange use of the term is being disavowed by almost all the contributors to the volume, Jewish as well as Christian. Especially, Dr. PARKES, in his excellent paper "Rome, Pagan and Christian", undertakes it to call the things and ideas by their right names, to describe the distinguishing characteristics of the two religions and their sharp contrasts, thus explaining the bitter conflicts between the Church and the Synagogue. On the other hand, it was a very happy idea of Dean H. F. STEWART to emphasize the striking parallelism between the casuistry of the Talmud and of the Moral Theology of the Jesuits, in his interesting paper "Casuistry : Jewish and Jesuit Dialectics". But, of course, casuistry is not to be regarded as a peculiar trait of Jewish or Catholic Theology; it is simply a general characteristic of all legal systems and of all religions attaining to the legalistic and ritualistic stage.

As already mentioned, the essays of the first volume consist of a series of lectures which were delivered at the King's College, an institution of the Church of England. They were subsequently published by the

Society for Promoting Christian Knowledge, which is connected with the Anglican Church. That these authorities of the Anglican Church have granted hospitality to an essay of the kind written by H. LOEWE is to be considered as a gesture of good will and as a sign of respect for science and pure scholarship. As the editorial secretary of the S.P.C.K. justly remarks, it demonstrates the aim of the Society "to present the facts as disinterestedly as possible", and will as such be highly appreciated by every student interested in the disinterested presentation of the facts.

New York City, SOLOMON GANDZ.

A. Hyatt Verrill. — (In collaboration with OTIS W. BARRETT) *Food America Gave the World.* xvi + 289 pp., 10 plates, Boston, L. C. PAGE & Co., 1937.

An elementary but very readable account of the contributions of the American Indian to the food crops of the world. The extent and originality of the native American agriculture has never been really appreciated and few, even among the anthropologists and archaeologists, have realized the obvious implications inherent in its development. YANOVSKY (*Isis* 27, 187) has pointed out that a total of more than 1100 species of American plants have furnished food to the various Indian tribes. Most of these plants, of course, were eaten only in times of famine, but the Indian actually cultivated between 100 and 120 different species, and more than 200 species contributed to their regular diet. Not a single species was cultivated in both the Old and the New World, and the agricultural methods had evolved along such different lines in the two hemispheres that the European immigrants had to be taught Indian agriculture before they could grow the native plants successfully. These facts are rather difficult to account for by any hypothesis of a diffusion of culture and can best be explained by assuming an independent origin of agriculture in the New World. Indeed the botanical evidence indicates that American agriculture is actually older than that of Europe and the Near East.

In this attractive and well illustrated book, Mr. VERRILL describes over 200 American food plants. In the appendix these are arranged according to their uses. Ten are listed as beverage plants and these include, of course, chocolate (*Theobroma cacao*), yerba maté (*Ilex paraguariensis*) and the unbelievably potent guaraná (*Paullinia capana*). Among the four cereals are *Zea mays* and wild rice (*Zizania aquatica*). The 105 fruits include the avocado (*Persea americana*), the blackberries and raspberries (*Rubrus spp.*), blueberries (*Vaccinium spp.*), huckleberries, cherries and plums (*Prunus spp.*), grapes (*Vitis spp.*), persimmon (*Diospyros virginiensis*), pineapple (*Ananas sativus*) and strawberries (*Fragaria spp.*).

Among the thirty miscellaneous food plants are the peppers (*Capsicum spp.*), beans (*Phasealus spp.*), peanut (*Arachis hypogaea*), pumpkins and squashes (*Cucurbita spp.*), tomato (*Lycopersicum esculentum*) and vanilla (*V. spp.*). The nineteen nuts include the black walnut and butternut (*Juglans spp.*), chestnuts (*Castanea spp.*), hickory nuts and pecans (*Carya spp.*) and Brazil nuts (*Bertholletsia spp.*). The thirty-two root vegetables include cassava (*Manihot esculenta*), Jerusalem artichoke (*Helianthus tuberosus*), potato (*Solanum tuberosum*), sweet potato (*Ipomoea batatas*), and the yams (*Dioscorea spp.*). These well-known edibles enrich the world's table but, as Mr. VERRILL clearly shows, they represent only a fraction of those which are now available, and lack only a market of educated palates.

The history of the cultivation and breeding of these American plants is unsatisfactory, as all histories of agriculture must be, for, in the very nature of things, agriculture precedes culture and consequently it develops into a relatively mature science before written records are possible. The development of Old World agriculture can be traced, after a fashion, because the wild ancestors of the domesticated plants have been discovered, and the improvements wrought by the cultivators recorded. On the other hand, many of the American plants have been so altered by selection that their wild ancestors either can not be recognized or, as seems more likely, they have been cultivated for so long a time that their ancestors have become extinct. The author does what he can to trace the history of the plants he describes so well, and his illustrations of the pre-Inca pottery models of the more common vegetables are particularly interesting as they show that the varieties which we cultivate are older than the Incas, how much older we have no way of knowing. Perhaps the author over-emphasizes this archeological evidence in his endeavor to locate the place of origin of the more widespread crop plants. For example, few botanists would deny that maize (*Zea mays*) was cultivated in Peru before the inhabitants of that country were civilized, but few would agree with the author that maize originated there. Its nearest biological relatives are to be found in the country of the Mayas, and all of the biological evidence agrees in designating that region as its probable place of origin.

It is perhaps not good form to look for scientific errors in such a well written popular book. The author has succeeded on the whole in producing a book with relatively few mistakes, but his attention should be called to several passages which can be altered for the better in subsequent editions. In describing the chestnut (p. 173, 240) the author notes that the young shoots which have come up from the stumps of dead trees seem to be immune to the all-destroying blight, and he assumes

that there is hope for the American chestnut. Others have shared this optimism only to discover that the shoots become infected when they reach the age when cracks appear in their bark. On page 49, the potato is described as a root vegetable. It is a tuber, not a root. On page 44, in describing the scarcity value of sweet potatoes, the author states, " in 1619, they cost from two shillings to half a crown per pound which, in those days, was almost equivalent to their weight in gold". Gold has rarely sold for from two shillings to half a crown a pound. These inaccuracies, however, are beside the point and do not detract materially from the value of the clear and simple presentation of an important subject.

CONWAY ZIRKLE.

Tobias Dantzig.—*Aspects of Science.* xi + 285 p. New York, MACMILLAN, 1937 ($ 3.00).

This book continues the theme of the author's earlier discussion of number (" Number, the Language of Science," 1930, cf. *Isis* : 16, 455-9), with more direct attention to the part played by mathematics in the conceptual structure of exact science. It undertakes to disestablish, one after the other, the absolutes of classical physics by showing these to rest finally upon a mathematical foundation of convention. " What we call objective reality is in the last analysis what is common to many and could be common to all thinking beings." With this quotation, heading the tenth chapter, the temper of the book is defined. To add to these words of POINCARÉ the author's own : " the question as to whether there is more to objective truth than mere collective agreement must remain unanswered, inasmuch as we have no other criterion for objective truth than collective agreement." (p. 213).

In particular, causal law defines no absolute order, but expresses a pragmatic requirement of prediction. Geometry can give no knowledge of the " absolute " nature of extension, but rests for its generality upon the human intuition of mathematical induction. The assurance that in " real " nature the requirements of mathematical analysis are met is no more than the physicist's *als ob*, his working fiat (p. 92). He assumes that the properties of the mathematical infinite are mirrored in nature (p. 107), and thereupon claims for his knowledge of nature the universality and necessity to be found in his mathematical tool. No absolute method exists for determining which of several alternative geometries is the geometry of the given world, for not even standards of measurement are free from the subjective taint of convention. Rigidity itself is but one more convention (p. 185). Turning from the relativities of space to those of time, we find no better ground for

objectivity. The unit of time measurement is fixed by "universal agreement," and the concept of simultaneity rests upon the operationally valid use of light signals. The basic attributes of space and time alike become "anthropomorphic hallucinations." (p. 224).

Relativity, thus initiated, pervades the other concepts of mechanics —inertia, force, mass, and energy. The naive realism of classical mechanics is gone. After contemplating, through mathematics, alternative possible worlds, men "in vain seek to establish the absolute character of their own" and in the end "suspect that their findings might have been prejudiced by their own predilections." (p. 262). Classical physics assumed for man the capacity to make clear the distinction between observer and observed (p. 264), thereby reserving to him the privilege of facing an uncontaminated natural order. This assumption falls. The concepts which were at first read as structures of the independent world are now acknowledged to be insinuations of the structure of the human "collective mind" into nature (p. 246). They are the "collective predilections" of the race (p. 263). They are our "master-instruments," hence not laws of Nature but human "necessities of thought and action." (p. 277).

The Kantian note of modern Conceptual Pragmatism is clearly marked. And with it the sceptical confession "that it is inherently impossible to ascertain whether any universe of human discourse possesses objective reality, or is but a fiction created by man's predilections." (p. 279).

The theme of the book is amplified by some references to the history of science, and some to theology and the influence of the church. On the whole these latter are unfortunate. We are told of Schoolmen who adopt ARISTOTLE because "his casuistry, his predilection for the static, his aversion for everything that moved, changed, flowed, or evolved admirably suited their purposes." (p. 45). Theology appears in the unattractive, albeit pragmatic, capacity of sedative for the restless will (p. 38, 272). It occurs to ask, after reading, how much better is the offered alternative of a structure of admittedly anthropomorphic hallucinations which we call the categories of science and which we recognize to be born in the human breast of an "ineffable will to permanence." (p. 115).

Notice should be drawn to the recurrent mention of an intuition upon which the mathematical analysis of infinity rests, namely "the inalienable conviction that what has been said or done once can ever be repeated." (p. 28, 98). This conviction has no basis either empirical or formal; it is, presumably, a non-rational and a priori intuition. It characterizes human acts in general. In the present discussion it serves the purpose of restricting the claim on the part of reason to be

adequate as a basis for the conceptual structure of science. In effect it is equivalent to the proposition that what is possible at all is possible again. Now the question comes to mind whether this is anything more than a statement in special form of the difference between a concept and the perceptual instances of a concept. For a concept is precisely such a thing as can be exemplified again and again, each case being recognized by some sort of human act. Is the non-rational character of this intuition of the indefinite repeatability of human acts really different from that of the relation between the general and the particular which permeates *all* rationality? If not, why emphasize the non-rational element in such a special form? An answer to this question is in order because of the particular doubts which the argument of the book throws upon the adequacy of reason to provide knowledge of nature.

(*Williams College*). RICHARD HOCKING.

Paul Tannery (1843-1904). — ***Mémoires scientifiques publiés par*** J. L. HEIBERG & H. G. ZEUTHEN. ***XIV, Correspondance.*** Editée par A. DIÈS. xiv + 664 p., 5 pl. Paris, GAUTHIER-VILLARS, 1937.

Almost every other volume of *Isis*, beginning with the first, has contained a review of one of M^me^ TANNERY's publications, seventeen volumes in all, that is, fourteen of the *Mémoires*, the new edition of *Pour l'histoire de la science hellène* (1930; *Isis* 15, 179-80), and two volumes of MERSENNE.

Volume XIII of the *Mémoires* was the first to be devoted to the letters, which are published in the alphabetical order of the correspondents; it contained the letters of 33 scholars (letters from them to TANNERY, and from TANNERY to them), and covered the beginning of the alphabet, A to C. In volume XIV, the same painstaking editor Canon A. DIÈS of the Catholic university of Angers, deals with the letters D to G. To show their great interest to the historians of science, it will suffice to give the names of the 30 correspondents, some of them so famous or so well known, that they need no definition. However, for each of them I have indicated the years of birth and death, and the number of letters. The editor has added a biography and bibliography of each correspondent.

DAST DE BOISVILLE (Bordeaux, 1868-99)	2	letters.
CHARLES DEJOB (Paris 1847-1916)	2	»
JULES DELAMARRE (Provins 1867-1909)	2	»
JOSEPH DELBŒUF (Liége 1813-1896)	33	»

DELBOEUF's is the largest collection (p. 17-134), revealing his penetrating mind and generous heart. DELBOEUF was not only a psychologist and philosopher but an original mathematician and logician.

Léopold Delisle (Valogne, Manche 1826-1910)	1	letter.
Etienne Delsol (Villeneuve-sur-Lot 1854-1930)	2	»
A. M. Desrousseaux (Lille 1861-). alias Bracke	2	»
Hermann Diels (Biebrich a. Rhein 1848-1922)	16	»
A. Dublange (1876-)	2	»
Pierre Duhem (Paris 1861-1916)	12	»
Jean Dupuis (Paris 1818; died in St. Germain- en Laye)	23	»
Felix Dürrbach (near Strassburg 1859-1931)	4	»
Victor Egger (Paris 1848-1909)	8	»
Gustav Eneström (Nora 1852-1923)	70	»

The Eneström correspondence contains the largest number of letters, 70 (p. 317-420), extending over twenty years, 1884-1904.

Alfred Espinas (St. Florentin, Yonne, 1844-1922)	5	letters.
François Evellin (Nantes 1835-1910)	3	»
Antonio Favaro (Padua 1847-1922)	39	»
Hervé Faye (St. Benoit-sur-Indre 1814-1902)	1	»
Franz M. Feldhaus (Neuss a. Rhein 1874-)	3	»
Claude Foucou (lawyer in Marseille, d. 1893)	4	»
Alfred Fouillée (La Pouëze, Maine-et-Loire 1838-1912)	2	»
Emile Fourrey (1869-)	2	»
Mgr. Fourier-Bonnard (Mattaincourt, Vosges, 1872-)	2	»
Abbé Georges Frémont (Poitiers, 1852-1912)	4	»
Wilhelm Fröhner (Karlsruhe 1834-1925)	2	»
Modestino del Gaizo (Avellino 1854-1921)	4	»
Henri Girard (St. Josse-ten-Noode 1841-)	2	»
Pierre Glotin (Lorient 1829-)	2	»
Edmond Goblot (Mamers 1858-1935)	4	»
Siegmund Günther (Nuremberg 1848-1923)	19	»

This list illustrates the great variety of Tannery's interests — philosophical, scientific and religious. Many of the letters reproduced are worth reading and a well made index will facilitate reference to them. The editor has also added a chronological list of the letters, ranging from 1877 to 1928 (the letters posterior to 1904 being naturally addressed to Mme Tannery). I would have preferred that the letters themselves be published in chronological order, for only thus is it possible to follow Tannery's thought as it developed under the pressure of circumstances and of his own genius. However, it would be ungracious to insist on this, instead of which I prefer to express once more my deep gratitude to Mme Tannery. I may be permitted to recall that volume IV of *Osiris*, being dedicated to her husband's memory and to herself, contains biographies and bibliographies of Paul and Marie Tannery.

George Sarton.

William H. George.—*The Scientist in Action.* London : WILLIAMS and NORGATE Ltd., 1936. Pp. ix+355. 10/6.

Dr. GEORGE has applied the scientific method to the study of scientific method. He has examined the behavior of scientists at work, has recorded his observations and has suggested hypotheses to account for this behavior. For the most part, the book is written in the indicative rather than the imperative or hortatory mood. Occasional assessments of value are presented as such ; they are not paraded as scientific propositions.

The study is divided into three parts : the scientific outlook, getting scientific facts and arranging scientific facts. In an express effort to divorce science and philosophy, Dr. GEORGE adopts the thesis that facts are simply " coincidence observations." He is not consistent concerning this point. Throughout the greater part of the work he tacitly recognizes that facts are the products of observation *in terms of a conceptual scheme*. Thus, in his treatment of the role of attention in scientific research he concludes that one function of scientific theory is to focus the investigator's interest on certain aspects of phenomena which would otherwise lie below the threshold of attention. Likewise, had the author adhered to his introductory premise that " thinking, believing or feeling are not " forms of action, that since they are not susceptible to direct observation, they had best be ignored, his lucid discussion of scientific theory would have been omitted.

The description of the process of scientific research leads to the conclusion which Professor BRIDGMAN introduced some ten years ago. Scientific facts involve certain operations which are so formulated that a repetition of them will yield the same results. On the other hand, theories are the results of a procedure which is as yet unknown. This may be one reason why scientific theories are more unstable than facts. The postulates of a satisfactory theory are clear, relatively few, logically consistent and are not expressed in terms of tendencies " to do or be the things which the theory is devised to explain." Deductions from these postulates must correspond to observed facts if the theory is to be accepted. A desideratum is that the theory lead to the discovery of hitherto unobserved facts and uniformities between facts.

This study will probably be condemned by some philosophers as naive and by some scientists as dealing with commonplaces. In any event, it appears to this reviewer as a concise and useful handbook of the elements involved in scientific research generally.

Harvard University. ROBERT K. MERTON.

Herbert Dingle. — *Through Science to Philosophy*. New York : Oxford University Press. $5.00.

The recent rapid and highly abstract development of modern physics has given a great practical urgency to the problem of the clarification of the philosophy of science. Traditionally the latest theories of physics have been grafted on to the habits and concepts of common sense thought and the result has been presented as the scientific world picture. Though such a picture never represented the true nature of the scientific process, nobody was much bothered by the fact except a few cranky idealistic philosophers who wanted to integrate science with the rest of human activities. The falsity of the philosophic picture in no way interfered with the proper functioning of science itself nor with the public respect for science which in the last analysis supports scientific research.

But as the pace of scientific progress quickened, various ruptures of intellectual equilibrium developed. In the first place the rapid change of scientific concepts and laws, even when these concepts and laws could still be incorporated into the common sense framework of time, space and causality, tended to generate a disturbing scepticism as to a world picture which was always being presented as a finished product and not as a developing process. Every day, so to speak, science was issuing new immutable laws of reality. To put things in this way meant that science was always proving itself to be false; whereas in truth the process represented a progress of science to greater heights.

In the second place the technical progress of science made it impossible to continue to graft the latest scientific concepts on a common sense base without tremendous paradoxes and confusions. The Einsteinian notions of space and time are a case in point. Finally the irregularity of development in certain parts of physics, analogous to the irregularity of a military front, with deep salients here and straight lines there, was disturbing to the scientific practitioner himself, who naturally aims at orthogonal lines and universal concepts. The quantum theory, which revealed that in certain situations light must be treated as a continuous wave structure and in other cases as a discontinuous array of corpuscles, may be cited in this connection. On the other hand the difficulties over causality, which the same theory developed, are a complex of embarrassments, partly arising from clinging too closely, in our philosophic description of science, to the common sense notion of causality, partly arising from the likelihood that even the technical notion of causality as it is effectively used in science may not be applicable in corpuscular situations.

All of these recent difficulties and embarrassments have created a crisis in our understanding of science, a crisis which, coming at a time

when the public is already disappointed with the social results of the practical application of science to industry, may have serious consequences for the future of scientific research. This crisis, it may be observed in passing, has scarcely been relieved by the habit of certain famous scientists of demagogically exploiting the paradoxes of the situation in their popularizations of the new physics.

All the more reason therefore to welcome this work by an eminent astrophysicist which makes a genuine effort to face the real problem of the clarification of the scientific perspective. In the words of Professor DINGLE, "the problem in which this book originates is that of reaching a point of view from which the present activities and the historical development of physics appear as parts of a single, continuous rational process."

To pose the problem in this light is more than half the battle. It means giving up discussing the specific nature of the universe on the basis of the necessarily incomplete data of science—which inevitably leads to rounding out the picture with philosophical constructions. It means instead tracing the various concepts and procedures of science back to their roots in conscious experience, and thus developing a sense of the movement and immanent outlook of the scientific process.

Following out this process of reflection Professor DINGLE proceeds to show that experience and reason, both given in direct consciousness, are the twin elements out of which both common sense and science build up conceptual structures. In Professor DINGLE's terminology we build "molecules" or objects out of atomic experiences. The difference between the common sense approach and the scientific approach is that common sense associates atomic experiences into more or less fixed objects once and for all, whereas science is continually developing new and more refined correlations of atomic experiences into new organized molecules and new correlations between the molecules themselves.

To illustrate the distinction it may be well to let Professor DINGLE speak for himself :

> "Here are two common sense physical objects — a billiard ball and a piece of sugar. The first is a spatio-temporal association of a red color, hard feeling, horizontal movement, and such things; and the second is a similar but differently located association of a white color, hard feeling, cubical outline, sweet taste, and so on. Now, as a scientist aiming at correlating my experiences as completely as possible, I find that these two associations are useless. I therefore break them up and make a different set of associations. I put the horizontal movement of the disintegrated billiard ball [by this is meant disintegrated into its atomic qualities] with the perpetual rest of the disintegrated piece of sugar, and form a general concept called 'motion' which includes them as examples. Similarly, I take the red color of the one and the white color of the other, and make

them up into a molecule covered by a concept 'light'. Proceeding in this way over all the atoms of my experience, I form an indefinitely large collection of individual movements and call the molecule so formed "motion"; and similarly an indefinitely large collection of individual colors, and call the molecule so formed 'light'. In the same way I form the molecules, 'sound', 'magnetism', 'electricity', and so on.

"I can now go ahead far better. I find that I can make 'laws' which cover all the constituent movements of the enormously large molecules of motion which I have made, and laws of optics which cover all the constituents of the equally large molecules of light... The sub-departments of physics are not billiard balls, sugar, and such things, but motion, light, sound, and others of the same class. We form laws of motion, but no laws of sugar."

This extract gives a good indication of Professor DINGLE's approach, and of the central truth which he derives from this approach. This central truth, which he presents with many variations in different contexts, is the freedom of science to break up common sense objects and correlate — and recorrelate — the atomic experiences according to the needs of developing scientific theory. He regards it as the misfortune of past descriptions of science that "the terms of expression which have satisfied the scientific workers have been those of common sense", for this has created all the needless delusions and paradoxes.

While agreeing wholeheartedly with this central message as far as it goes, the present writer would observe that it leaves unanswered a number of problems, and that this deficiency is in turn traceable to Professor DINGLE's choice of a rather narrow starting point as the basis of his reflections on the relation of science to human experience. Thus, while the superiority of the scientific organization of experience over common sense is implicitly stated throughout the book, his explicit comparison of the two yields no basis for determining the value relations of the two approaches. We are told : "In contemplating these alternative syntheses of experiences, there is one fact of which we cannot too frequently remind ourselves : namely, that the exchange of the common sense for the scientific molecules is not in any fundamental sense the adoption of a true instead of a false or less true method of rationalization... If 'truth' is to be brought into the matter at all, then the common sense molecules are true for the everyday business of life and the scientific molecules are true for extending rationalization."

Obviously the question arises : Is science good only to extend rationalization and give the scientist something to do, or does it also serve "the everyday business of life?" If science has a practical importance — and most obviously it has — then science has an element in which it is superior to common sense, even though science is not absolutely superior in the sense of being all-sufficient, without any recourse to the practical categories of common sense.

The reason Professor DINGLE has not been able to trace adequately the inter-relations between the common sense categories and the various abstractions of science — for him common sense is something science gets away from but never presumably has to come back to — is that he has undertaken to build a complete philosophy out of science alone. By science he means physics, biology and psychology. He has rejected the idea that science is merely one type of developed rational correlation, side by side with, say, ethics and esthetics, although the very idea of science as correlation which he expounds begs for a functional interpretation of scientific activity in a wider philosophy of human experience. Such a wider philosophy would embrace the common sense categories not merely as the starting point for science but as the composite matrix from which all the clarified intellectual functions (including ethics, esthetics and even clarified religion) have developed. It would then trace the various interrelations between these intellectual functions and common sense thought, which remains a permanent fixture of the human reasoning structure, dominating the apparatus of imagination by which we ascend to the more abstract scientific and intellectual categories.

This is not the place to outline such a wider critical philosophy of human experience. These broad suggestions are sufficient to indicate, however, how narrowly Professor DINGLE has limited his reflective base. In a sense he has not completely gotten away from the common sense realism which he so strongly condemns in the traditional interpretation of science. For after all, to regard science as a complete and all-sufficient basis for a philosophy is merely to repeat in a diluted form the common sense illusion of identifying the relations and categories given in a limited bit of experience with the total and permanent structure of reality.

Despite the limitations which the present writer feels compelled to point out in Professor DINGLE's work when considered with reference to the total problem it poses, the work is highly stimulating in the sphere in which it does operate. It is particularly valuable in the discussion of the concrete philosophic problems of contemporary physics — entropy, determinism, causality and the like — to which the concluding chapters are devoted. And even with regard to the larger problem the work is significant in that it sets going a leavening process of reflection which will undoubtedly spread.

Washington, D. C. BENJAMIN GINZBURG.

Rudolf Carnap.—*The logical syntax of language.* Translated from the German by AMETHE SMEATON (Countess von ZEPPELIN). N. Y. :

HARCOURT, BRACE and Co.; London: KEGAN PAUL, TRUBNER, TRENCH and Co., Ltd., 1937. XVI+352 pp.

This admirable translation of an important contribution to pure logic and foundations of mathematics is all the more welcome to English-reading students in many fields inasmuch as it contains many valuable sections suppressed in the original German edition for want of space.

Numerous topics in other fields than those mentioned above are profitably considered in this work, and students of philosophy and the foundations of natural science, as also those interested in theories of language, will find it worth serious study. For the avowed objective is to lay the foundations for a study of the logic of the empirical sciences, which study is conceived as the sole proper function of philosophy. Part V is concerned exclusively with explaining the application to this topic of the pure logical theory which has preceded it.

As the title suggests, logic and syntax, hitherto studied separately, are conceived to form interdependent parts of one subject, logical syntax. This subject has an empirical branch, concerned with formulating rules for languages already naturally developed, such as English, German, and the like, and a pure branch, concerned with laying down rules for the artificial construction of a language. CARNAP's concern in this book is with pure logical syntax for the construction of languages more suitable to the expression of empirical science.

Traditionally, syntax has concerned itself with the rules for constructing various types of complex expressions, *e.g.*, sentences, out of the simple or uncompounded signs, *e.g.*, the words, of a language. Past studies of syntax have always been empirical. Traditionally, logic has been conceived as concerned with the formulation of rules for the valid passage from one set of propositions, the premisses, to another set, conclusions. By some logicians the propositions in question have been viewed as identical with the sentences of language. CARNAP adopts this view and finds it affecting the whole fusion of logic and syntax mentioned above.

Historically logicians and grammarians have striven to express their results formally, *i.e.*, without reference to the meanings or types of meaning that the expressions under consideration might possess. But this endeavor has always largely failed. At the very best they relied on classifications of words made by a consideration of their different types of meanings. This was in part due to the confinement of attention to natural languages, like English, and in part to the separate investigation of syntax, with its " formation rules," and logic, with its " transformation rules." The well-known language whose logical syntax comes nearest

to a completely formal presentation is the artificial one presented by WHITEHEAD and RUSSELL in their *Principia Mathematica*.

CARNAP proceeds in parts I, II, and III of this work formally to construct, through presenting their formation and transformation rules, two more languages, both of which have certain advantages over that of *Principia Mathematica*. Interest in these languages springs from the fact that, although both are purely formal in their construction, they are yet adequate vehicles for the expression of the principles of empirical science and the description of contingent matters of fact. It is not, however, claimed that they are the only suitable languages. In fact, CARNAP presents two in order to point out certain directions in which adequate languages may differ, and to illustrate the study, taken up in Part IV, of General Logical Syntax; *i.e.*, of principles of syntax expressible without specification of any single language.

The enormous fecundity of this work makes impractical any attempt at a more extended résumé. The reviewer is, however, constrained to comment on a small selection from the vast number of important features and contributions yet unmentioned.

CARNAP's book is full of analyses purporting to distinguish types of linguistic usage and to show the insuperable difficulties with which students obstruct the advancement of knowledge when they fail to recognize these types and the varying import which they bear. These analyses, together with the pure logical enquiries culminate in the critical survey of philosophy and its relation to science that constitutes Part V of the book. As persons familiar with CARNAP's work would guess, the traditional problems of philosophy are largely accounted pseudo-problems owing their occurrence to the confusion of these various modes of speech, and the only function of philosophy as a branch of learning is declared to be the study of the logic of science, *i.e.*, the analysis of the language of science.

Among the modes of speech so distinguished are the *autonymic mode of speech*, wherein a sign is used to symbolize itself (as, *e.g.*, when the mathematician writes, "Substitute 3 for x in..."); the *material mode of speech*, wherein language apparently describing facts of the physical (or metaphysical) world is used instead of palpably equivalent language, belonging to the *formal mode of speech*, which describes characteristics of the language in which the physical world is described. (*E. g.*, "The moon is a thing," is the parallel in the material mode of speech of the sentence, "'Moon' is a thing-word (*i.e.*, sign belonging to such and such syntactical category)," in the formal mode of speech.)

CARNAP's purpose in making these distinctions is not to rule out as wrong or inappropriate such modes of speech as the autonymic and

material. In fact, he argues that they are often useful because of their simplicity, psychological directness, and so on, and he employs them within limits in this work itself. But he contends that it is through a failure to recognize their instances for what they are that much confusion and many distractions to sound learning have occurred. It is CARNAP's opinion that so far as any noetic importance is to be attached to the sentences of traditional philosophy, it will be through treating them as instances of the material mode of speech and through finding their parallels in the formal mode.

All of this, as analysis of different modes of speech and as descriptive of a technique for elucidating sentences of traditional philosophy, the reviewer finds highly satisfactory. But two reservations must accompany his expressions of approval. In the first place, the translations made by CARNAP, in Part V, of philosophical and other sentences from the material to the formal mode leave much to be desired. While they are often suggestive, they seldom suffice to justify abandoning further attempts to analyze the originals. These originals frequently confuse a welter of meanings only one strand of which is ever isolated by CARNAP's translations. The sentences in question usually belong to types commonly employed in English, and until they are thoroughly analyzed this difficult problem in research will be unfortunately incomplete (1).

In the second place, the reviewer must object to CARNAP's insistence that the formal mode of speech reveals the real meaning of what is obscurely expressed in the material mode. For example, it is said that what we are dealing with is " in reality,... a case of language and its connections," and not, as the material mode " misleads us into thinking... extralinguistic objects." (2)

Such declarations would seem to be wholly unscientific, *metaphysical* (in CARNAP's sense), and unfortunate. First, often we are not dealing with a case of language. When CARNAP translates, " The moon is a thing," by " ' Moon ' is a thing-word," he is not dealing with English. English syntax recognizes no such category as " thing-word." At best it is a translation which might have been made if English syntax had been different from what it is, as it might have been. As such the translation enlightens. But to the reviewer it seems inappropriate to say that either sentence reveals what they are both *really* about. What a sentence " is about " would seem too vague a concept to admit of

(1) CARNAP is here aiming only at an illustration, but we think his procedure suggests a too facile brushing aside of the important problems in analysis here to be encountered.

(2) *Cf.* p. 298.

incorporation in this technical treatise. It is a concept demanding the type of scientific analysis CARNAP always favors.

Certain other limitations to the professed tolerance and generality aimed at in this work persist; for example, CARNAP aims in the general syntax, rather than in a special syntax, to organize and improve the theory of logical types. Several excellent contributions are made to this theory; but there is at the same time no provision made for possible languages that would avoid or eliminate every scheme of logical types. Again, the two languages developed by CARNAP are distinctive and illustrative of the possibilities for variety in languages, in their illustration of the " coordinate-language " form as opposed to the usual " name-language " form.

To establish the very possibility of such coordinate languages and to investigate their logic and feasibility is a great liberalizing advance. But again, the advance actually made suggests further liberalizations that CARNAP has not recognized. Thus his general syntax is largely worked out with the coordinate pattern in mind. Further the variety possible within the general coordinate scheme is not suggested. What seems to the reviewer an arbitrary prominence is given to spatio-temporal concepts. This is of course one of the distinguishing marks of his physicalistic theory, possibly tenable and worth investigation, but out of place when it narrows the perspective of the pure logician.

The review of this truly excellent book must not end, however, on a note of disparagement; the volume develops too many highly successful and valuable concepts. It breathes an atmosphere of freedom, of progress in cooperative inquiry.

Duke University. HENRY S. LEONARD.

Johannes Tropfke. — *Geschichte der Elementar-Mathematik.* Dritter Band : Proportionen, Gleichungen. Dritte, verbesserte und vermehrte Auflage. IV+239 pages. WALTER DE GRUYTER & Co., Berlin und Leipzig, 1937. (Price RM 10).

More than thirty-six years ago, in 1902, the first edition of TROPFKE's *Geschichte der Elementar-Mathematik* appeared in print. Ever since that time the tireless author continued collecting and correcting, adding and sifting his material, so that we have before us now, in the third edition, the mature fruits of the work of a lifetime.

In contrast to the great historical work of MORITZ CANTOR, TROPFKE's history of mathematics is arranged systematically, according to the subjects and topics. TROPFKE is less concerned with the mathematicians, their life-history and the historical background, than with the history and progress of the mathematical ideas and theories, special

attention being given also to the development of the mathematical language and script, the terminology and the symbolism of mathematics. The third volume deals with proportions and equations, but while the theory of proportions is disposed of in twenty pages, the whole bulk of the book, more than two hundred pages, is devoted to the discussion of the history of equations.

The third edition was greatly improved, and also enlarged by the inclusion of a considerable amount of new material, particularly in the fields of Babylonian, Egyptian and Arabic algebra. Thus TROPFKE was able to make use of the algebra of ABŪ KĀMIL SHUJĀ' (*c.* 900), which is now available in a German translation made by DR. JOSEF WEINBERG from the Hebrew version of MORDECAI FINZI (*c.* 1470). ABŪ KĀMIL's work is of great importance for the history of algebra and deserves further investigation. ABŪ KĀMIL SHUJĀ' had deeply influenced LEONARDO FIBONACCI (*c.* 1200) and through him mediaeval mathematics in general. He is the first known to us to relate Oriental algebra to Greek geometry, by referring to EUCLID, II 5-6, as furnishing the demonstration for the solution of the quadratic equations. The geometric proofs in AL-KHUWĀRIZMĪ's algebra are basically different from the Euclidean demonstrations and have nothing to do with Greek geometry. ABŪ KĀMIL's algebra is based upon AL-KHUWĀRIZMĪ's algebra and was intended to be an elaboration and further development of the same. ABŪ KĀMIL not only introduces the *new Greek* demonstrations of the Euclidean geometric algebra, but he also makes an effort to preserve the *ancient Babylonian* type-forms of equations and methods of solution, which were discarded by AL-KHUWĀRIZMĪ.

In the last decade there grew up a rich crop of newly discovered material in the field of Babylonian algebra. As usual in such cases, the decipherment, translation and edition of the texts must pave the way for their proper evaluation and interpretation from the point of view of the historian of mathematics. Already in his extensive monograph "Zur Geschichte der quadratischen Gleichungen über drei einhalb Jahrtausende" published in the *Jahresbericht der deutschen Mathematiker-Vereinigung*, 1933-34, TROPFKE grapples with the difficulties of Babylonian algebra and with the problems confronting us in the history of the quadratic equations. The reviewer has devoted a rather comprehensive study to the same subject in *Osiris* III, pp. 405-557, under the title "The Origin and Development of the Quadratic Equations in Babylonian, Greek, and Early Arabic Algebra". (A short summary of it appeared in *Scientia*, 1937, pp. 249-257). In this essay the reviewer arrived at results which differ, considerably, from those reached by TROPFKE in his present volume and in his monograph just mentioned.

The reviewer, in his essay, advanced a new theory concerning the original type-forms of equations and methods of solution developed by the ancient Babylonians, and also concerning their relations to Greek and Arabic algebra. The student who is interested in the deeper investigation of the subject is herewith referred to these studies.

Professor TROPFKE is to be congratulated on his great achievement, and we heartily wish him to succeed in soon bringing out the third edition of his remaining volumes. His book has become a standard work in History of Mathematics which no serious student of the subject can afford to miss in his library. The reviewer believes that the book well deserves to be made available in an English translation, so that the English scholar, too, may easily enjoy the great wealth of information assembled by TROPFKE from the widely scattered literature which grew up during four thousand years in the history of the discipline so closely connected with the history of our civilization.

New York City, SOLOMON GANDZ.

P. W. Wilson.—*The romance of the calendar.* 351 p., 13 figs. London, GEORGE ALLEN and UNWIN Ltd., 1937. (Cloth, 10 s. 6 d.)

According to the Foreword, " there does not seem to be any book of convenient size—at any rate, in the English language—that surveys the development and the significance of the calendar as a whole... No book, certainly no book so full of factual and speculative material as this, has ever been published without a percentage of what experts —sometimes differing from one another—will consider to be error. On any point of the kind I shall be happy to stand corrected... Friendly criticism in the reading of the manuscript and proofs has come from such eminent authorities as..." (the list includes the names of a lord, a bishop, two astronomers, and four other scientists or scholars). The reader of the Foreword might think that here, at last, is an authoritative English book on comparative calendariography—not as complete and technical as GINZEL's three-volume *Handbuch der Chronologie*, of course, but a readable condensation of it, at least. The reader of WILSON's book will be disappointed ; to judge by the thirteen-page Index, the author never heard of GINZEL. The author uses source material of questionable quality and uncertain vintage, and shows a regrettably uncritical attitude toward his sources. The result is a " popular " book of little value to serious readers. I did not take the trouble of reading the book as a whole—neither, for that matter, could the eight eminent authorities mentioned in the Foreword have read the whole MS and all the proofs ; I have read several chapters, and I have picked up a considerable amount

of errors, inaccuracies, etc., while glancing through the rest of the book. Here is a random selection from this collection of noticed errors.

P. 59: "Dozen is the colloquial English for the French *douzieme* or twelve..." If it were not for the author's italics, I might have overlooked this interesting statement.

P. 71: "In the Egyptian year of 365 days, there remained five days which had still to be accounted for. They are called "the five *Epagomenal* days"—a word which means extra-monthly..." Experts agree that ἐπαγόμενος comes from ἐπάγειν, to bring in over and above, to add, to intercalate. Since the author's Greek seems to be worse than his Latin, the "parallelopipedon" on p. 162 displays, apparently, the common but incorrect spelling rather than a misprint.

On p. 135, the author interprets "Imperante Constantino Indictione V" as "the fifth year of the Indiction of the Emperor Constantine." It was not the fifth year of the Indiction of the Emperor Constantine; Constantine was Emperor, and it was the fifth year of the Indiction.

P. 32: "The Butaks of Sumatra measure time by intervals between smallpox epidemics." That is all the author has to say in his book about the Battak (sing., Batta); their elaborate calendar and its relations to the calendars of other civilizations are outside the author's sphere of knowledge.

On p. 307, speaking of the International Date Line, the author makes the following statement: "For instance, the 180th meridian is not everywhere a straight line on the map. It deviates to the east and so includes the Fiji... Islands... Also it deviates to the west and so includes the Aleutian Islands..." The 180th meridian does not deviate, but the International Date Line does; the type of map projection, incidentally, determines whether the 180th meridian is represented as a straight line or not.

P. 142: "In the year 1582, it was thus ordained that eleven days be omitted from the calendar. This meant that October 4 was followed immediately by October 15..." Of course 15 — 4 = 11, but if the author—or his son, OLIVER W. WILSON, who has assisted him "in the arduous task of examining source material"—had taken the trouble of consulting the text of "Inter gravissimas," he would have found that the papal bull, anticipating this kind of popular reckoning, explicitly ordained that "in the month of October of the year 1582, ten days, from the fifth to the fourteenth, these both included, be omitted..."

On p. 141, LUIGI GIGLIO or ALOYSIUS LILIUS, the great calendar reformer, seems to be mentioned as two people, ALOYSIUS and LILIUS. Since none of these names can be found in the thirteen-page Index, and since it is unlikely that the author ever heard of THOMASO GIGLIO,

we must assume that the LILIUS mentioned by the author, on p. 141, is ALOYSIUS, not THOMAS, and that WILSON'S ALOYSIUS is ALOYSIUS LILIUS.

Chapter 19, Stones of Mexico, occupies twelve pages; my acquaintance with the Sunday supplements of papers for people who think is very superficial, but I believe that Stones of Mexico could make the grade. "We stand in contemplation of the Aztec Calendar Stone and its hideous rival, the Stone of Sacrifice"—not in contemplation of the Maya stelae. The chapter is full of absurd or misleading statements. Although the author avoids a systematic elementary survey of the Maya calendar, he manages to offer us "factual and speculative material" which he should have kept out of print. P. 159: "In Mexico they (i. e., the Maya) had 28 weeks of 13 numbered days which again leaves one day to be accounted for." P. 161: "They started an entirely different year of 13 numbered months each of 20 hieroglyphic days—perhaps the earliest 13-month calendar—and as this year was only 260 days long, they were left with 105 days on their hands." These two samples of the author's ideas concerning the tzolkin will be fully appreciated by readers familiar with the Maya calendar. Readers interested in archaeology will be surprised to learn that the "Mayans" dragged the Aztec Calendar Stone to Mexico City. Some of the "fascinating speculations" concerning the "mystery" and the „enigma" of the "culture of Mexico and of her neighbors" ought to please the Rosicrucians in Palo Alto, California.

On p. 166, the author evokes "... the historic scene on Mount Moriah when the Patriarch Abraham, obeying what he believed to be a divine behest, raised his knife against his only son Isaac, bound upon a Pagan altar." The author does not question the historicity of the event. We are not surprised, therefore, when we find, in the Chronology, at the end of the book, such items as

B.C. 7000—First traces of primitive calendar in Egypt.
B.C. 2160 (circa)—Birth of Abraham in Ur of the Chaldees.
B.C. 1178—Eclipse mentioned by Homer identified.

This ten-page Chronology begins with B.C. 18000 (circa) and ends with 1936. It is hardly necessary to point out that it does not mention the Asyut calendars, the astronomical ceilings of SENMUT or SETI I, or the Karnak clepsydra—rather important items in the history of the calendar, tangible, authentic, and reasonably well dated items. The last four pages of the Chronology deal with the events of our century, chiefly with the activities of the calendar reform organizations. The interest of the author in calendar reform is evident throughout the

book ; it is to be regretted that his knowledge of the " worldwide development of the calendar throughout the course of history " (p. 329) does not match his enthusiasm for calendar reform.

A. POGO.

Sir James Jeans. — *Science and Music.* x + 258 pages. The MACMILLAN Company, New York (1937).

This attractive book is a clearly written, popular account of the scientific aspects of music.

The first chapter, "The Coming of Music", gives an introductory sketch of the evolution of the ear, the process of hearing, the transmission of sound, and the graphical representation of vibrations. In the second chapter on "Tuning Forks and Pure Tones" the author explains the physical basis of the properties of musical tones in terms of the theory of vibrations. The physical theory of stringed instruments is set forth in the third chapter, "The Vibrations of Strings and Harmonics". Then follows a chapter, "The Vibrations of Air", in which the theory of organ pipes and wind instruments is outlined. The fifth chapter, "Harmony and Discord", presents some historical material on musical scales, i.e., the Pythagorean, Mean-Tone, Equal Temperament and Just Intonation. Speculating about music of the future the author states, "But a 53-note scale would give far purer harmonics than the present scale, and we can imagine future ages finding it worthy of adoption—especially if mechanical devices replace human fingers in the performance of music". Architectural acoustics is discussed in the sixth chapter on "The Concert Room". The final chapter, "Hearing", present items selected from the psychology and physiology of hearing.

The book is richly illustrated with plates of sound curves and other diagrams; an artistic frontispiece depicts musical scenes among the Sumerians 2700 B. C. Although popular, this book will appeal to specialist and layman. The treatment includes physics, psychology, physiology, architecture and music, and the specialist in any one field will appreciate with the layman the popular accounts of other fields.

University of California.
Berkeley, Calif.

V. F. LENZEN.

Paul F. Schurmann. — *Historia de la física.* Montevideo, 1936. Anales de la Universidad, entrega no. 139, XVI + 1359 p., 82 illustrations.

While Spanish culture, art, and science are being stifled and destroyed by war, an elaborate history of physics, probably the first in the Spanish

language, has just been completed in the interior of peaceful Uruguay by a Belgian physicist, Professor PAUL F. SCHURMANN, director of a secondary school connected with the University of Uruguay. It was begun in England about twenty years ago when he collected historical material to interest his college students in physics, chemistry, and natural science, and has been written especially for teachers and students. The author believes that the history of the separate sciences should form an integral and fundamental part of the courses in those sciences and that the general history of science should constitute one of the principal components of universal history.

The book consists of more than three hundred biographical sketches, arranged chronologically. A vast amount of biographical information about other scientists is given in the footnotes. Each great epoch is introduced by a general sketch of its greatest achievements. A general résumé of one hundred and fifty pages, arranged according to the customary order of subject matter in textbooks of general physics and provided with cross-references to the biographical sketches, facilitates the historical study of each branch of physics : mechanics, hydrostatics, pneumatics, heat, acoustics, optics, and electricity and magnetism. Thirty-four pages of chronological tables from 640 B. C. to 1934 A. D., an author index of more than sixteen hundred names, and a table of contents complete the book.

The biographical sketches present the essential facts about the work of each physicist and just enough personal information to arouse the interest of the students. The scientists included are representative of all ages and countries, and the book is entirely free from nationalism and prejudice. It includes many scientists whose major interests were in mathematics, astronomy, or chemistry.

Among the mathematicians one finds PYTHAGORAS, EUCLID, ARCHIMEDES, G. W. LEIBNIZ, the BERNOULLI family, LEONHARD EULER, J. L. LAGRANGE, J. B. J. FOURIER, K. F. GAUSS, and RENÉ DESCARTES; among the astronomers, PTOLEMY, COPERNICUS, TYCHO BRAHE, JOHANN KEPLER, the HERSCHEL family, OLE RØMER, and the Marquis DE LAPLACE. The large amount of space devoted to chemists emphasizes the intimate relation between chemistry and physics. Special sketches of the following chemists are included : ROGER BACON, J. B. VAN HELMONT, ROBERT BOYLE, THOMAS GRAHAM, JOSEPH BLACK, JOSEPH PRIESTLEY, C. W. SCHEELE, A. L. LAVOISIER, C. L. BERTHOLLET, JOHN DALTON, W. H. WOLLASTON, J. L. GAY-LUSSAC, P. L. DULONG, ROBERT BUNSEN, D. MENDELÉEFF, Sir WILLIAM CROOKES, J. W. GIBBS, Sir WILLIAM RAMSAY, and SVANTE ARRHENIUS.

On page 129 the author refers to PRIESTLEY's "dephlogisticated air"

as nitrogen; the article on PRIESTLEY, however, (pages 463-4) mentions correctly his discovery of "dephlogisticated air" — *oxygen*. PRIESTLEY's contributions to physics included researches on the propagation of sound in various gases, the electrical conductivity of flames, spark spectra, and the fusion of wires by the spark discharge. In his "History of Electricity", page 732, PRIESTLEY stated in 1767 : "May we not infer from this experiment [with an electrified cup], that the attraction of electricity is subject to the same laws with that of gravitation, and is therefore according to the squares of the distances?" In 1785 C. A. COULOMB proved experimentally the exactness of this law.

The scientific results of various expeditions are discussed, including COLUMBUS's observation on August 13th and 14th, 1492 of the deviation of the magnetic needle. This effect was long attributed to faulty construction of the compass.

The work of women as independent research physicists, collaborators, authors, translators, and commentators receives fair and just treatment. Among those mentioned are HYPATIA, M^me^ LAVOISIER, Mrs. ALEXANDRE MARCET, CAROLINE HERSCHEL, M^me^ CURIE, MARY SOMERVILLE, la Marquise DU CHÂTELET, LAURA BASSI, SOPHIE GERMAIN, SONJA KOVALEVSKY, and Mrs. HENRY SIDGWICK, who collaborated with the third LORD RAYLEIGH.

Among the Spanish scientists mentioned are the philosophers DOMINGO SOTO and RAIMUNDO LULIO, the navigators JORGE JUAN and ANTONIO DE ULLOA. the engineer AUGUSTO BETANCOURT (also known as BETHENCOURT Y MOLINA), and the physicians FRANCISCO SALVA and NICOLAS and JUAN MONARDES.

According to Professor SCHURMANN, "COPERNICUS and GALILEO are the two most outstanding geniuses of the scientific renaissance and are rightly considered the promoters of a new era. But while GALILEO is at the crest of the Italian Renaissance begun by LEONARDO DA VINCI, COPERNICUS is the expression of the Northern Renaissance and the Reformation, of which ERASMUS was the promoter." Of GALILEO he says : "Much more important than GALILEO's astronomical and optical investigations were his discoveries in mechanics, such as the study of the motion of the pendulum, the laws of falling bodies, the law of inertia, the independence of forces, the composition and decomposition of forces by the rule of the parallelogram, the fall of bodies on an inclined plane, the motion of projectiles, the principle of virtual forces, uniformly accelerated and retarded motion, etc."

OTTO VON GUERICKE's water barometer was almost as dramatic as his Magdeburg hemispheres. Its long arm was located inside and its short arm on the front of his house. A float connected to a little puppet

rose and fell as the air pressure varied, and indicated on a scale the weather forecasts.

From the account of the early Italian academies, one learns that the *Accademia del Cimento*, which existed from 1657 to 1667, published all the papers of its nine members anonymously. These included experiments on atmospheric pressure, the expansion of metals on heating, magnetism, the propagation of sound, and static electricity. The academicians froze water artificially with various mixtures of snow with salt, alcohol, sal ammoniac, and saltpeter, and demonstrated its expansive power.

The author believes that EDMÉ MARIOTTE (1620-84) was the first physicist in France to recognize fully the value of the experimental method. MARIOTTE not only discovered BOYLE's law independently, but also discovered the blind spot of the eye, which he demonstrated before the Royal Society of London and King CHARLES II.

R. A. FERCHAULT DE RÉAUMUR (1683-1757) is presented not merely as the discoverer of a little used thermometric scale but as the most learned French scientist of his day. By his improvements in the manufacture of steel, tin plate, and porcelain, he also increased the wealth of France.

JOHN DALTON (1766-1844) was "almost as famous in physics as in chemistry." His principal work in physics was the study of the expansion of gases, their specific heat, the maximum vapor tensions of water, and his law of partial pressures of mixed gases.

Of J. L. GAY-LUSSAC (1778-1850) the author says that "during this half century (first half of the nineteenth), there was no progress in physics or chemistry to the realization of which GAY-LUSSAC did not directly or indirectly contribute."

The account of Z. T. GRAMME (1826-1901), "the Belgian Edison" who invented the first industrially successful dynamo, is a dramatic story of the young carpenter who studied GANOT's *Physics* in night school and soon began to make important improvements in alternating current machines.

The book describes the historical development not only of pure physics but also of its practical applications, including : printing, aerostation and aeronautics, illumination, the magnetic compass, steam navigation, the steam engine and locomotive, timepieces, refrigeration, telegraphy and telephony, and photography.

In the first edition of a vast work such as this, some oversights in proofreading are to be expected. Many of the names of persons are incorrectly spelled. On page 1027 appears the statement that the scintillations produced by alpha particles impinging on a zinc sulfide screen

were first observed by Sir WILLIAM CROOKES and independently by ELSTER and GIESEL. The name GIESEL should be corrected to read GEITEL. Although the bibliography might well be expanded, there are many helpful references in the footnotes. Since the book records the history of physics only up to the year 1900, EINSTEIN's theory of relativity and many recent developments in atomic physics and radioactivity are not discussed.

This new history of physics ought to be warmly welcomed by teachers and students throughout the Spanish-speaking world and should stimulate interest in the history of science in general and especially the neglected field of Spanish and Latin-American scientific history.

University of Kansas. MARY ELVIRA WEEKS.

Alexander Findlay.—*A hundred years of chemistry.* 352 pp., 11 figs. The MACMILLAN Co., New York, $ 4.25, 1937.

This carefully written book contains a surprising amount of condensed information on the progress of chemistry since 1835. The development of organic chemistry from 1835 to 1865 is first discussed in detail. During this period LIEBIG and WÖHLER discovered the benzoyl radical in bitter almond oil; J. B. DUMAS, E. M. PÉLIGOT, J. J. BERZELIUS, J. VON LIEBIG, R. BUNSEN, and others developed the theory of organic radicals; A. LAURENT and C. F. GERHARDT worked out the substitution theory, which finally triumphed over BERZELIUS's dualistic electrochemical theory of compounds; A. WURTZ, A. W. VON HOFMANN, and A. W. WILLIAMSON pointed out the existence of various "types" of organic compounds, such as the "water type" and the "ammonia type," a fertile idea which GERHARDT in France, T. STERRY HUNT in the United States, and F. A. KEKULÉ in Germany later generalized. EDWARD FRANKLAND's doctrine of valence helped in determining the arrangement of the atoms in the radicals. KEKULÉ and A. S. COUPER independently put forward a theory of molecular constitution based on the quadrivalence of carbon and the ability of carbon atoms to form mutual linkings.

Confusion as to the proper method of choosing the atomic weight of an element from its combining weight often showed itself in the various formulas assigned to the same compound. The DULONG-PETIT law of constancy of atomic heat and EILHARD MITSCHERLICH's law of isomorphism aided BERZELIUS in drawing up his table of atomic weights, while the vapor density method, based on AVOGADRO's hypothesis and GAY-LUSSAC's law of combination of gases by volume, guided J. B. DUMAS. To settle the confusion, there was held at Karlsruhe in 1860 the famous conference at which STANISLAO CANNIZZARO made a clear distinction

between atoms and molecules. In the meantime, attempts at classifying the elements were made by J. W. DÖBEREINER, J. A. R. NEWLANDS and others, until finally the periodic system, almost as we now know it, was worked out independently by LOTHAR MEYER and D. MENDELÉEFF.

PASTEUR's study of optical activity as a molecular property is discussed in detail. As early as 1808 W. H. WOLLASTON had suggested a three-dimensional arrangement of the atoms. J. H. VAN 'T HOFF and J. A. LE BEL, with their conception of molecular asymmetry based on the tetrahedral carbon atom, laid the foundations for stereochemistry. VAN 'T HOFF's prediction of optically active compounds of the allene type, RR'C = CRR', whose asymmetry would be due not to any one carbon atom but to the molecule as a whole, has recently been confirmed by PETER MAITLAND and W. H. MILLS of Cambridge.

Two chapters are devoted to the development of physical chemistry in the nineteenth century. A systematic investigation of the relation between physical properties and chemical composition was made by H. KOPP ; the kinetic theory was developed ; many so-called " permanent gases " were liquefied ; the sciences of thermochemistry, electrochemistry photochemistry, chemical dynamics, and thermodynamics were developed; catalysts were investigated ; the mass law was deduced by GULDBERG and WAAGE ; the phase rule by J. WILLARD GIBBS. In the meantime VAN 'T HOFF developed his theory of solutions, ARRHENIUS his theory of electrolytic dissociation. " Inspired by the theories of VAN 'T HOFF and ARRHENIUS, the investigation of the properties of solutions of non-electrolytes and of electrolytes was pursued by the younger chemists of both hemispheres with all the fervour of a new age."

The synthetic period of organic chemistry was ushered in by P. E. M. BERTHELOT in 1860. E. FRANKLAND synthesized hydrocarbons of the methane series ; CHARLES FRIEDEL and J. M. CRAFTS, the aromatic hydrocarbons ; tautomerism was investigated, and the structure of benzene elucidated. Many of the early syntheses were based on coal tar as a raw material for the production of dyes, medicinals, photographic chemicals, and explosives. A. W. VON HOFMANN discovered that coal tar contains benzene, a source of aniline. His eighteen-year-old student W. H. PERKIN discovered the first coal tar dye, aniline purple, or mauve. As new dyes and new methods of synthesis were developed, industry had to respond by producing profitably the necessary intermediates. After CARL GRAEBE and C. T. LIEBERMANN had solved the composition of the dye alizarin, " an industry of great monetary value passed from the field to the factory." The theory of color as related to constitution was worked out by O. N. WITT, H. E. ARMSTRONG, R. M. WILLSTÄTTER, and many others.

BERTHELOT believed that the fundamental problem of organic chemistry was to prove " that compounds identical with those produced by plants and animals can be synthesized from inorganic or mineral matter." This has now been proved beyond all question. The chemist, however, is still ignorant of the mechanism by which these processes go on in the living organism. EMIL FISCHER's elucidation of the structure of the hexose and pentose sugars " constitutes the first great test and vindication of the importance and validity of the VAN 'T HOFF-LE BEL theory." According to this theory there should be $2^4 = 16$ optically active, isomeric aldo-hexose sugars. With the aid of phenylhydrazine, which gives characteristic osazones with these sugars, FISCHER and his collaborators synthesized and identified most of these sixteen predicted aldo-hexoses. The last two of them have recently been synthesized by W. C. AUSTIN and F. L. HUMOLLER. " The British chemists have made their most valuable contributions " in explaining the structure of the disaccharides, the starches, and cellulose.

EMIL FISCHER also discovered the nature and structure of the proteins and purines. His " greatest achievement in this domain " was the building up of mono-amino acids " into more and more complex structures which he called *polypeptides*."

Since only about twenty pages are devoted to the discovery of new elements, the statements are sometimes too brief to give credit where due. Tellurium, for example, was not discovered by KLAPROTH but by MÜLLER VON REICHENSTEIN, as KLAPROTH himself clearly stated. KLAPROTH recognized uranium as a unique substance, but E. M. PÉLIGOT in 1841 was the first to isolate it. BERZELIUS's careful work in isolating amorphous silicon and H. C. OERSTED's isolation of aluminium (two years prior to that of WÖHLER) certainly deserve mention. Although BALARD's announcement of bromine was published prior to that of CARL LÖWIG, LÖWIG deserves mention as an independent discoverer of that element. DAVID ALTER's work on spectroscopy, which preceded that of ROBERT BUNSEN, has also been overlooked. The statement on page 220 that G. URBAIN's name *lutecia* for element 71 has been " universally accepted " is not quite correct. German-speaking chemists call this element *cassiopeium*, using the name which Baron AUER VON WELSBACH assigned to it.

The twentieth century witnessed the rapid development of colloid chemistry. The discovery of X-rays and radioactivity gave a new outlook regarding atomic structure and valence. " Whereas the classical physical chemistry of the nineteenth century dealt with the properties of substances, regarded as collections of molecules, the newer physical chemistry seeks to investigate the individual molecule." X-ray analysis

has yielded " amazing verification of the structural formulae which had been adopted on purely chemical grounds."

The VAN 'T HOFF-LE BEL theory of asymmetry made it possible to predict the optical activity of compounds containing an asymmetric atom of nitrogen, sulfur, selenium, tellurium, silicon, tin, or phosphorus instead of an asymmetric carbon atom. PASTEUR observed that " artificial products have no molecular asymmetry." Many unsuccessful attempts have been made to explain the origin of optical activity in nature and to form optically active compounds under the directive action of circularly polarized light. " All, however, met with failure until, in 1929, WERNER KUHN and E. BRAUN, and later KUHN and E. KNOPF, of the University of Heidelberg, attained success. By the photochemical decomposition of a complex amide, an optically active compound was obtained the rotatory power of which varied in sign according as the light was dextro- or laevo-circularly polarized... The possibility that the formation of the first asymmetric molecule took place under such directive influence is thereby established..."

In conclusion there are a chapter on the development of industrial chemistry, some brief biographical notes pertaining to sixty of the chemists mentioned in the book, and a good index. On page 11 and page 80 there are allusions to LAVOISIER's enunciation of the law of conservation of mass. MAX SPETER has pointed out, however [*Chem.-Ztg.*, 55, 993 (Dec. 29, 1931)], that this principle was recognized long before the time of LAVOISIER. The terms *anode*, *cathode*, etc. should not be credited to FARADAY (as on page 17) but to WILLIAM WHEWELL. [See SPETER, *Z. f. d. gesamte Naturw.*, Heft 7, pp. 295-9 (1935); FARADAY's *Diary*, vol. 2, p. 272 ff. Facsimile letter of WHEWELL to FARADAY, May 6, 1834.] The pioneer work of F. F. RUNGE on coal tar colors deserves fuller treatment; Father J. A. NIEUWLAND's work on artificial rubber and L. V. REDMAN's on synthetic plastics are well worthy of mention.

This comprehensive and inspiring record of chemical progress can be especially recommended to students preparing for higher degrees in chemistry.

University of Kansas. MARY ELVIRA WEEKS.

J. R. Partington. — *A Short History of Chemistry*. New York, The MACMILLAN Company, 1937. xiv + 386 pages. Illustrated. (Price $ 2.50).

This book is an excellent short textbook of the history of chemistry. It contains rather more information than some of the texts, and will serve in many instances as a book for first reference, a place in which

to look first for the information which one is seeking. The author says in his Preface :

"The intention of the present work is to give a concise survey of the history of Chemistry, suited to the requirements of students preparing for degree examinations. The period before BOYLE has been treated briefly, although greater prominence than usual is given to VAN HELMONT on account of his undeniable importance. The development of Chemistry in the later part of the nineteenth and in the twentieth century is only briefly sketched and illustrated by the work of a few outstanding chemists; this part of the subject is dealt with in the ordinary lecture courses on Chemistry, and need not be repeated in a book of this kind.

...In subject matter also, an attempt has been made, by a careful division of topics, to find a better balance than has sometimes been attained. Most histories of Chemistry lay too much emphasis upon Organic Chemistry, and there are several special histories of this subject; more consideration has now been given to the important development of Physical Chemistry, no special history of which has yet appeared."

The first three chapters, treating respectively of The Origins of Applied Chemistry (Early Applied Chemistry, Early Knowledge of Metals, Glass, Dyes), of The Beginnings of Chemistry (The four Elements, Chemical Knowledge of the Classical Period, The Chemical Papyri, Alexandria, The Beginning of Chemistry, Alexandrian Chemistry) and of The Diffusion of Alchemy (Chemistry in Arabia, Hindu Chemistry, Chemistry in China, Alchemy in Europe, Early European Writers on Alchemy, ROGER BACON, ARNALD OF VILLANOVA, RAYMUND LULLY), occupy forty pages and bring the history to the time of PARACELSUS. While this is probably a sufficient treatment of the early period to meet the needs of a student of chemistry "preparing for degree examinations", it seems to the reviewer to be entirely inadequate for the student who wishes to get as liberal an education as possible out of his study of science. Enough for the training of a chemist perhaps, but certainly not enough for an educated man. Curiously, too, it does not reflect one of the major interests of PARTINGTON himself who has made notable contributions to our knowledge of the early period. He is Chairman of the new Society for the Study of Alchemy and Early Chemistry. The cultural value of the history of early chemistry is large. Concerned with a time when the various intellectual disciplines were not yet separated, it brings the student in contact with the whole idea system of an ancient people, out of which system ideas chemical and nonchemical have been transmitted — transmitted by the processes of history which the student may thus see at work — separated, revised, recombined or held separate ; and these are the ideas which influence our present life in innumerable ways in chemistry and out of it. A study of the logical structure of ancient doctrines, of the morphology of dead beliefs, may be made without

prejudice, and will help the student to evaluate fairly the opinions which prevail at present.

Chapter IV deals with Iatrochemistry, or Chemistry in the Service of Medicine (PARACELSUS, VAN HELMONT, SYLVIUS, AGRICOLA, BASIL VALENTINE, LIBAVIUS, GLAUBER, LEMERY, TACHENIUS, KUNCKEL) and terminates with a brief tabular Summary of the Early History of Chemistry. Chapter V, Early Studies on Combustion and the Nature of the Atmosphere, describes the work of BOYLE, HOOKE, MAYOW and JEAN REY, and includes a short account of the phlogiston theory of BECHER and STAHL. Chapter VI treats of the Discovery of Gases (HALES, BLACK, CAVENDISH, SCHEELE, PRIESTLEY), and Chapter VII of LAVOISIER and the Foundations of Modern Chemistry. Chapter VII and all those which follow it contain Summaries and Supplements which greatly increase the scope and value of the book. In Chapter VII the author says :

"In this, and further summaries, the broad outlines of the work of each of the chemists dealt with in the text are summarized, and the opportunity is often taken of giving a brief mention of other chemists, or of work done by those dealt with in the text, in addition. The summaries are, therefore, in some ways an addition to the chapters and should not be passed over by the student. Summaries of topics are also given for the purpose of correlating information given in different places in the text."

The remaining Chapters, headed respectively VIII, Laws of Combining Proportions and the Atomic Theory; IX, DAVY and BERZELIUS and the Electrochemical or Dualistic Theory; X, The Beginnings of Organic Chemistry; XI, Substitution, the Unitary and Type Theories; XII, The Theory of Valency; XIII, The Development of Organic Chemistry; XIV, The History of Physical Chemistry; XV, The Periodic Law; and XVI, The Structure of the Atom, are such that the student may learn chemistry as well as the history of chemistry from them. The Summaries are excellent. That at the end of Chapter XIII makes mention of twenty six organic chemists, always with dates, and of many others who collaborated with them or worked in related fields. The Supplement of Chapter XIV similarly contains twenty paragraphs each devoted to a single physical chemist and the field of his researches. The Supplement of Chapter XV, entitled The Development of Inorganic Chemistry, likewise contains fourteen paragraphs. The book ends with A Short Bibliography which "contains particulars of some works which may be consulted for further details, and also books on the History of Chemistry (of varying value)", and with name and subject indexes. It is fully illustrated.

The excellent textbook is attractive and moderately priced.

TENNEY L. DAVIS.

Yearbook of Agriculture, 1936, 1189 pp., $ 1.25; **1937,** 1497 pp., $ 2.00. *United States Department of Agriculture,* Washington, 1936-1937.

In 1933, the Secretary of Agriculture appointed a committee on genetics to make a national and, to some extent, an international survey of practical breeding and of the genetic research on those animals and plants which are important in American farming. The results of the committee's activities are incorporated in these two Yearbooks of the Department of Agriculture, which contain, in addition to the Secretary's two annual reports to the President, sixty-five scientific papers, a total of 2400 pages, approximately 1,250,000 words. Lack of space excluded two complete articles and two bibliographies which will be published in the *1937 Yearbook Separates.* The papers fall into two groups. Eight are elementary expositions of fundamental theoretical genetics, and contain, incidentally, brief accounts of the history of genetic research, while the remaining articles describe both the practical application of genetics to animal and plant breeding, and the particular results obtained by the Department of Agriculture, of which the Department is obviously and rightfully proud. The Department has been conducting genetic experiments on an amazing variety of forms; on the more usual crop plants such as the small grains, maize, vegetables, fiberplants, fruits and berries and the more important farm animals such as sheep, hogs, cattle and horses. In addition it has investigated nut and timber trees, Angora goats, milk goats, dogs, bees, fur-bearing animals and tropical fruits. The Department has endeavored to improve each commercial variety either by increasing its quality and productivity or by breeding new forms immune to the usual diseases.

The majority of the contributions follow a common plan of exposition and thus the work as a whole is unified in spite of the diversity of subject matter. The papers regularly begin by describing the place of origin and the native type of those forms which man has been able to domesticate; then follows a necessarily brief history of the domestic varieties and the changes wrought in them by human selection, often the unconscious selection of primitive herdsmen and farmers. As we would expect, the greater part of each paper consists of the history of planned genetical experimentation, particularly of the research which followed the re-discovery of Mendelian heredity. The contributions of the Department of Agriculture are, of course, not overlooked, and each article ends with an account of present problems and research in progress.

The two *Yearbooks* would constitute an Encyclopedia of Genetics, except for the fact that they do not cover the most advanced phases

of fundamental theory. They are, however, required reading for anyone who would write a genetic textbook and they form a mine of readily available information for the, as yet, unwritten history of genetics.

CONWAY ZIRKLE.

Herbert Osborn. — *Fragments of entomological history, including some personal recollections of men and events.* vii + 394 p., errata, portrait frontispiece. 47 pls. included in pagination. Columbus, Ohio, Published by the author, 1937.

The author for thirty-five years was Professor of Zoology and Entomology at Ohio State University. Under his tutelage no less than sixty-eight doctor's degrees in entomology were given. He has thus played an important part in the building up in the United States of the science of entomology along systematic, ecological, and applied lines during the period of its greatest development. The book is more than a mere fragmentary account of this period, for it contains an immense amount of well-ordered detailed information, especially in the 146 pages of personal sketches of American entomologists. The author also has assembled 375 portraits of entomologists reproduced in the plates. It is an exceedingly useful addition to our histories of entomology.

The book contains chapters on early steps in entomology prior to 1800; on its expansion in the 19th century with special mention of the part played by the MELSHEIMER family of York County, Pennsylvania, the fathers of American entomology; on the growth of governmental agencies making use of applied entomology and also very active in building up all other aspects of the science, such as the Federal services, the State Entomologists, Inspectors, and Quarantine Officers, and the entomological work in State Agricultural Experiment Stations; on entomological instruction and graduate work; on the development of entomological societies, publications, and collections; on regional developments in the United States and elsewhere in the Western Hemisphere; and notes on faunistic studies, nomenclature, fossil insects, entomological libraries and illustrations.

The historical values of this work lie in its assembled data on the growth of governmental agencies aiming to control insect pests and its riches of data concerning the lives of entomologists and fields of research during the period and in the country of its greatest development.

CHARLES A. KOFOID.

Alfred Charles True.—*A history of agricultural experimentation and research in the United States,* 1607-1925, 321 pp. *U. S. D. A. Miscellaneous Publication No.* 251. Washington, 1937.

The first settlers along the Atlantic sea board were forced into

agricultural research, for they found to their sorrow that European agricultural methods could not be applied without modification to American plants. During the late Colonial and early National periods valuable contributions to agricultural methods were made by the real leaders of the country (WASHINGTON, JEFFERSON, etc.) and such outstanding citizens as JARED ELIOT, JOHN BARTRAM, and EDMUND RUFFIN. Agricultural societies were numerous and active; new agricultural machinery was continually appearing and an agricultural depository was established in the Patent Office. This depository evolved into the Department of Agriculture, whose head is of Cabinet rank. While Dr. TRUE traces the entire history of agricultural experimentation in the United States, he emphasizes primarily the machinery of experimentations and thus the greater part of his book is concerned with a detailed account of the organization and development of the U. S. D. A. and the several State Experiment Stations. His work is packed with information which would be difficult to find elsewhere, but it is essentially a history of scientific institutions rather than a history of a science. C. Z.

Jakob Baxa. — *Die Zuckererzeugung*, 1600-1850. 231 p., 48 fig. Jena, FISCHER, 1937 (geb. 32; br. 30 RM).

Um mich eines Ausdrucks zu bedienen, den sich das Kongress-Wien von 1814/15 aus dem englischen "fashionable", durch Fortlassen des Wort-Schlussteiles, in dem neuen Wort "fesch" zurecht zimmerte (und "geschmackvoll" bedeutet): Dieses Werk des Wiener Professors ist fesch; Es ist fesch im Inhalt, fesch in der Gruppierung und — last not least — fesch in der Ausstattung. Es ist, im Auftrage der Beamtenschaft der Leipzig-Lundenburger Zuckerfabriken-Actiengesellschaft (in Oesterreich), als Ehrengabe für deren Präsidenten, RICHARD Ritter VON SKENE, zum 70. Geburtstag, geschrieben worden, von einem Manne, der hierzu nicht nur die massgebliche deutsche gedruckte Litteratur, sondern auch viele, in österreichischen Archiven (von Wien und den Provinzen) bisher ungehobene lagernde Schätze ans Tageslicht gezogen hat. Es ist darum, in den interessant-interessierend geschriebenen Kapiteln [ANGELUS SALA (1637), Westindischer Zucker (um 1700), Europäischer Zucker (um 1700), Domingoer Zucker-Katastrophe (1791)] in ersten Teil, das über "Die Zuckerindustrie in Österreich im letzten Viertel des 18. Jahrhunderts"; im zweiten Teil, [unter den Kapiteln: Die wissenschaftliche Entdeckung des Rübenzuckers, die deutsche Zuckerfabrikation während der Kontinentalsperren] wiederum das über "Die Zuckerfabrikation in Österreich während der Kontinentalsperre" und über "Wiederaufstieg der österreichischen Kolonialzuckerraffinerien"; im dritten Teil [unter den Ausführungen über: Wieder-

aufstieg der Rübenzuckerindustrie in Deutschland, die Rübenzuckerindustrie in Frankreich, den Londoner Zuckermarkt 1841 bis 1847] ebenso das Kapitel über "Das Wiedererwachen der österreichischen Rübenzuckerindustrie" und das über "Die Zuckerindustrie in Österreich bis 1850", am wertvollsten. Womit nicht gesagt ist, dass die anderen, aus Druckwerken und Abhandlungen sorgfältig kompilierten Kapitel bedeutungslos wären. Denn selbst der Spezial-Zucker-Historiker kann hierbei neue Druckwerke oder dergl., bzw. neue Gesichtspunkte kennen lernen. Wohltuend berührt es, immer wieder sehen zu können, wie peinlich genau der Verfasser stets seine Quellen zitiert. Auch in diesem Punkt : Ein fesches Werk !

Damit der Verfasser-POLYKRATES es aber nicht mit den Göttern zu tun bekommt, seien hier einige CERBERUS-Bisse ausgeteilt : S. 67 ist BLACKS (statt missverstandenem Namen BLACK), S. 171 der Name HAUD (statt richtig HAUDE) zu verbessern, ebenso S. 75 HUMPHREY (statt richtig HUMPHRY) DAVY. Es geht nicht an, den anonymen Verfasser des *Neuesten deutschen Stellvertreters, etc.* (1799) zunächst als mit RUMPF identifiziert sicher hinzustellen (S. 70), um dann (S. 71) eine andere Ansicht zu Worte kommen zu lassen. Es liegt diese Divergenz vermutlich darin begründet, dass der Verfasser das (ebenfalls 1799 erschienene) zweite Heft (nicht zweite Auflage zu verstehen !) des epochemachenden *Neuesten deutschen Stellvertreters* und ebensowenig die die Autorschaft RUMPFS ausdrücklich in Abrede stellende Erklärung des Verlags jener Broschüre, nicht kannte. Bedauerlicherweise kannte der Verfasser auch eine, die Epoche HANEWALD-ZIER richtig beleuchtende Veröffentlichung im *Centralblatt für Zuckerindustrie* von 1934 (S. 786-788 : "Dr. ZIER, Zerbst's Zucker-Zier. Entglorifizierende Bemerkungen, etc.") nicht, die ihn sicherlich seine wohlmeinenden Aeusserungen (S. 168-172) über das angebliche Wiedererwecken der deutschen Rübenzuckerindustrie zu Anfang der 30-er Jahre des v. Jhrdts. revidieren haben lassen würden. Auch eine "Zucker-Sauerei Anfrage vom Jahre 1820" (A.e.a. O., S. 388) liess sich der Verfasser entgehen. Referent glaubt diese Mankos ruhig konstatieren zu können, trotzdem er der Verfasser der beiden eben erwähnten Abhandlungen ist.

Dieses lesenswerte Werk BAXAS hat einen feschen Wiener Drucker gefunden : Die "Steyrermühl" in Wien, und einen renommierten Verleger : GUSTAV FISCHER in Jena. Sie haben aus dem Opus BAXAS ein Prachtwerk geschaffen !

Berlin. MAX SPETER.

C. Stuart Gager.—*Botanic Gardens of the world, material for a history. Brooklyn Botanic Garden Record* 26 : 149-353, (1937).

This is a directory of the botanic gardens of the world, both extant

and extinct. Several years ago, Dr. GAGER sent a questionnaire to all the gardens of record. Some were returned with full answers, others with only meager replies and still others were never returned. The data are consequently much more adequate for some gardens than for others, yet, in spite of the lacunae, which the author deplores, the directory presents the spade-work of a greatly needed history of botanic gardens. The information assembled includes the date of the establishment of the gardens, their area, a chronological list of their directors, their type of plantation, size of herbaria and libraries, publications, affiliations, and sources of income. The directory will repay study; even a cursory examination reveals many interesting facts such as the preeminence of the Italian gardens in the 16th, 17th and 18th centuries and the remarkable growth of the American gardens during the last fifty years. A startling bit of information is to be found concerning the United States Botanic Garden at Washington which, from its founding in 1842 to 1934, had cost a total of $ 3,511,180 ($ 5000-$ 6000 a year in the early years, a maximum expenditure of $ 173,960 in 1930). According to an investigating Congressional Committee, the activities of the garden in recent years " have consisted mainly in the purchase, care, and distribution of growing plants... Comparatively speaking, propagation, experimentation, and kindred activities have been limited. Another activity of the garden... is the giving away of growing plants and cut flowers to members of Congress and friends... Its activities as an educational institution... as a scientific establishment or as a botanic garden within the definition previously submitted, are wholly negligible."

CONWAY ZIRKLE.

Jerome E. Brooks. — *Tobacco.* Its history illustrated by the books, manuscripts and engravings in the library of GEORGE ARENTS, jr., together with an introductory essay, a glossary, and bibliographical notes. Vol. 1, large quarto, xvi-544 p., many illustrations. New York, ROSENBACH Company, 1937.

(The edition is limited to 300 copies, and will include 4 volumes. Volume 1, Introduction and text of catalogue, $ 75; Volume II, Text of catalogue, $ 75; Volume III, Text of catalogue, $ 65; Volume IV, Text of catalogue, glossary and index, $ 50. Total cost $ 265. Vol. 1 was published in January 1937, vol. 2 will be out around March 15th. The reviewer has seen only vol. I).

This book is essentially a "catalogue raisonné" of the "tobacco" library gathered by GEORGE ARENTS, jr., a business man and "corporation official", born in New York in 1875. However, the learned author, JEROME E. BROOKS, has added an elaborate introduction (185 p.) wherein the disconnected elements represented by the ARENTS' books, manu-

scripts and engravings are inserted in the context of historical tradition and may thus be viewed in their proper perspective.

I have not been able to examine the book very critically, as it is kept in the "treasure room" of this library, and who could enjoy and judge fairly a book on tobacco without smoking? It has all the appearances of being a sound book and, in spite of its high price, a valuable one. I say "in spite of its price", because many editions de luxe are futile and worthless. This book is apparently valuable, and thus the sale of it for a fabulous price is the more to be regretted. Indeed, consider the result of such a policy: it restricts the ownership of that tool to people who are not able to use it, or would not use it if they could (their time is far too precious!); on the other hand it makes ownership of the tool impossible to the very people who could appreciate and use it. Could one invent anything more topsy-turvy, more idiotic?

The *catalogue raisonné* begins with AMERIGO VESPUCCI's account in WALDSEEMÜLLER's *Cosmographia* (Saint Dié, 1507), RAMON PANE's in PETER MARTYR's *De orbo novo decades* (Alcalá de Henares 1516, again Venice 1534), GONZALO FERNANDEZ DE OVIEDO Y VALDÉS : *La historia general de las Indias* (Seville 1535), JACQUES CARTIER : *Brief récit* (Paris 1545), REMBERT DODOENS : *Cruydeboeck* (Antwerp 1554). All the items are placed in strict chronological order, the last one being 1615. I suggest that students of the period 1506-1615 will do well to consult this book, if they can, even if they are not particularly interested in tobacco.

There are a few beautiful illustrations in color, and many more, facsimiles and portraits, scattered through the text. These facsimiles are abundant and sufficient, but not especially remarkable; they certainly do not justify the high price of the work.

It is clear that the owner of the collection and producer of this book is one of those snobbish individuals who collect this or that as a part of a scheme of personal aggrandizement and social climbing; their aims are essentially mean and selfish; they do not only want to possess precious and beautiful things, they want to possess them as exclusively as possible. It is not enough for them that an object be beautiful or intrinsically precious, it must be rare. They could not well enjoy a thing unless they felt secure in the exclusiveness of their enjoyment. They could not be completely happy, except if they were sure that other people, presumably less deserving of happiness, were sufficiently miserable.

I exaggerate a bit, as one must to illuminate a situation, but it is clear that men like Mr. ARENTS are as remote as it is possible to be from the true artist or scholar whose enjoyment of beauty or of truth must be shared to be fully enjoyed, and can never be shared enough to appease their hearts.

The same book might have been published at ten or five dollars a copy and thus be made available to many scholars, but that would not have been dignified enough for the producer and would not have satisfied his greed and snobbery. In that case the producer would have incurred a loss (not necessarily greater than that involved by his edition de luxe, and perhaps smaller), but he would have been generous and beneficent, instead of being the opposite.

I beg the reader to appreciate that my anger is due to the fact that JEROME E. BROOKS did his task well, and that the book is apparently good. If it were bad, its high price would have left me indifferent, and its value to illiterate snobs would have been just the same. As long as the spirit of exclusiveness is restricted to expensive futilities such as big mansions, yachts, jewels, and furs, it really does not matter, but when an attempt is made to introduce that hateful spirit into the sanctuary of learning, then it is time to protest and to give the trespassers the castigation which they deserve.

What little I have seen of this book has given me great respect for Mr. BROOKS, but none whatsoever for Mr. ARENTS, whose proper place is obviously in the lowest circle of Hell.

GEORGE SARTON.

Richard Hennig.—*Terrae incognitae* ; eine Zusammenstellung und kritische Bewertung der wichtigsten vorkolumbischen Entdeckungsreisen an Hand der darüber vorliegenden Originalberichte. Vol. II, 200-1200 n. Chr. ix+399 p. Leiden, BRILL, 1937 (6 guilders, cloth 7.50).

Dr. HENNIG is known to historians of geography for his book *Von rätselhaften Ländern*, and for numerous articles and special studies dealing with the obscure and legendary side of geographical exploration. He has recently been engaged in a well-publicized polemic with EGMONT ZECHLIN over the possibility of pre-Columbian discoveries of America. *Terrae Incognitae* consolidates Dr. HENNIG's position as master of this particular field of research. In it he has attempted to bring together all the important texts which describe or refer to voyages into dimly known regions before the time of COLUMBUS. Volume I, published in 1936, covered the period down to the end of the second century of our era. Volume II reaches the year 1200, and a third will be required to complete the later Middle Ages.

The textual passages are presented in German translation with references which will enable the reader to turn to the original. In many cases the text has been excerpted, only those sections being printed which throw light on the occasion, the extent and the circumstances

of the voyage. Little if any of the material is new to scholars; most of it is to be found in standard collections such as the Monumenta Germaniae Historica. Nevertheless it would be extremely difficult for an individual to assemble even a fraction of it for ordinary purposes of instruction or research.

The service which Dr. HENNIG has thus performed is greatly enhanced by the notes which he has provided for each of the selected texts. Besides placing each document in its historical setting and discussing its significance, he has also summarized, and in many cases attempted to decide the controversies which have grown out of it. Thus some of his notes become critical excursus of great value; it would be hard to find more complete and compendious accounts of the state of such questions as the Gog and Magog legend, the Norse discoveries of America, etc.

Taken together the texts and notes provide a virtually complete picture of the history of travel, insofar as it resulted in the actual extension of the geographical horizon. It is as though the concise geographical sections of Dr. SARTON's *Introduction* had been expanded and restored to full proportions by setting them in the original documents from which they were abstracted. It is a wide and impressive picture. During the heart of the Dark Ages in Europe we see stirrings of activity over more than half the earth's surface, the discovery of Formosa, Buddhist monks travelling in India, and Chinese armies performing military feats surpassing that of HANNIBAL, Hindus discovering and colonizing Madagascar, Moslem diplomats at the court of CHARLEMAGNE, Arab traders in the Baltic, Irish monks restlessly seeking out the islands of the north Atlantic and anticipating the bold adventures of the Vikings. The success of Dr. HENNIG's enterprise inspires the wish that other fields of the history of science might be brought closer to the focus of advanced instruction by similar source collections.

Harvard University. DANA B. DURAND.
Cambridge, Mass., U. S. A.

Arduinus Kleinhans. (O. F. M.). — *Historia studii linguae arabicae et collegii missionum ordinis fratrum minorum in conventu ad S. Petrum in Monte Aureo Romae erecti.* Tomus unicus, xx + 508 p. (Biblioteca bio-bibliografica della Terra Santa e dell'Oriente Francescano. Nuova serie — documenti, diretta dal P. GIROLAMO GOLUBOVICH, O. F. M., Tomo XIII). Quaracchi presso Firenze, Collegio di S. Bonaventura, 1930.

As I have long dreamed of writing a history of Arabic philology, a dream which is likely to remain unrealized, it was a very pleasant surprise

for me to come across this volume. It is a valuable study, which the author of the much needed history I have in mind will be glad to have, yet it is a little disappointing. The work is divided into four parts as follows : I. The organization and history of the study of Arabic and of the Franciscan missionary college in San Pietro in Montorio (Trastevere), 53 p.; II. Biographies of the lectors in Arabic (pp. 57-108), Albanian, Greek, controversy, and moral theology (as you see, Arabic studies are only a part of the story); III. The students (149-426). Conclusion; IV. Appendices.

The story of Arabic studies begins naturally with RAMON LULL (see my *Introduction* 2. 900-14, chiefly p. 911), and the first of the appendices contains the text of the decree of the council of Vienne (1311-12) inspired by him, considering the study of languages (this is the only early document given by the author, the next being dated 1610).

The Arabic teachers dealt with are twenty in number, the earliest being father THOMAS OBICINI DE NOVARIA (d. 1632), the founder of Arabic studies in San Pietro in Montorio. It will suffice to name the others : LUDOVICUS DE MELITA, PETRUS MABOUL, DOMINICUS GERMANUS DE SILESIA, ALEXIUS DE TUDERTO, ANTONIUS DE AQUILA, GERARDUS DE MEDIOLANO, MARCUS DE LUCA, DANIEL DURANTI DE ARRETIO, BONAVENTURA DE MOLAZZANA, BONAVENTURA DE S. AGATHA, ANTONIUS DE MONTE REGALI, AUGUSTINUS MARONITA, JOSEPH DE STERNATIA, ANTONIUS DE JERUSALEM, ANTONIUS MARIA DE CASABASCIANA, AMBROSIUS DE ROMA, GAUDENTIUS DE ZUCCARO, SALVATOR DE CASABASCIANA, ILLUMINATUS DE POPHIS (d. 1857). The biography and bibliography of each Father is given ; the bibliographies seem to have been compiled with great care but the Arabic titles are omitted ; " Ex defectu characterum arabicorum in typographia, titulos arabicos omittere debemus." The titles should at least have been transliterated ; but the absence of Arabic type in an Arabic bibliography, in a review of Arabic studies, is deplorable.

None of these Franciscan Roman Arabists was very important, and their Arabic publications (as far as can be judged from this book, the bibliographies of which may be assumed to be complete) were relatively few and insignificant. THOMAS OBICINI published a logical *Isagoge* in Arabic (1625), an Arabic grammar (1631) and a *Thesaurus Arabico-Syro-Latinus* (1636) ; DOMINICUS GERMANUS, an Italian-Arabic dictionary, *Fabrica overo dittionario* (1636) and a grammar (1639), and left many works in manuscript ; other works of the same kind were written (some of them published) by LUDOVICUS DE MELITA, ALEXIUS DE TUDERTO, ANTONIUS DE AQUILA, MARCUS DE LUCA ; the majority of these Franciscan fathers did not write at all. It is probable that all of their time and energy were claimed by their pedagogical and religious duties.

Nevertheless we should be grateful to Father KLEINHANS for this devoted and faithful account. It is not his fault if the harvest is not richer. His work is as far as I know the second to tell the history of an old Western Arabic school and of a Western Arabic tradition. As such it is very precious. The first study of that kind was written on a smaller scale by W. M. C. JUYNBOLL apropos of the Dutch Arabic tradition in the seventeenth century (no date, 1934?, *Isis* 24, 220). One cannot help wishing that the sizes of these two studies had been reversed, for it was Juynboll's privilege to deal with two giants : THOMAS ERPENIUS and JACOBUS GOLIUS, the second of whom is well known not only to Arabists but as well to historians of mathematics and astronomy.

GEORGE SARTON.

James George Frazer.—*Aftermath, a supplement to The Golden Bough*. xxi+494 pp. New York : The MACMILLAN Co., 1937. $3.00.

This volume is a supplement, as the title purports, to the author's work, *The Golden Bough*, and consists of materials which had been overlooked before the publication of the index volume in 1915 and of those which have since become available. Those familiar with FRAZER's work will not be disappointed in this voume. If anything, time has but added to the author's mastery of the art of exposition, and as always it is a pleasure to read what he has written. In the Preface to the present volume the author states that in *The Golden Bough* "as in all my other writings, I have sought to base my conclusions by strict induction on a broad and solid foundation of well-authenticated facts. In the present work I have extended and strengthened the foundation without remodelling the superstructure of theory, which on the whole I have seen no reason to change. But now, as always, I hold all my theories very lightly, and am ever ready to modify or abandon them in the light of new evidence. If my writings should survive the writer, they will do so, I believe, less for the sake of the theories which they propound than for the sake of the facts which they record."

It is a great privilege to hear the author speak thus, for it is a happiness to know that he realizes what the fate of his great work is likely to be. The facts he has brought together will live, the theories which have been spun about them may be replaced by others, but the fructifying influence which Sir JAMES FRAZER's thought had exerted and will continue to exert upon generations of humanists will live for ever. I cannot more appropriately close this notice of this book than by quoting these words from FRAZER's Preface :

"When I first put pen to paper to write *The Golden Bough* I had no conception of the magnitude of the voyage on which I was embarking;

I thought only to explain a single rule af an ancient Italian priesthood. But insensibly I was led on, step by step, into surveying, as from specular height, some Pisgah of the mind, a great part of the human race; I was beguiled, as by some subtle enchanter, into inditing what I cannot but regard as a dark, a tragic chronicle of human error and folly, of fruitless endeavour, wasted time, and blighted hopes. At the best the chronicle may serve as a warning, as a sort of Ariadne's thread, to help the forlorn wayfarer to shun some of the snares and pitfalls into which his fellows have fallen before him in the labyrinth of life. Such as it is, with all its shortcomings, I now submit *The Golden Bough* in its completed form to the judgement of my contemporaries, and perhaps of posterity.'

New York University. M. F. ASHLEY-MONTAGU.

Ashley-Montagu, M. F. — *Coming into being among the Australian aborigines.* (Foreword by B. MALINOWSKI) 362 pp. GEORGE ROUTLEDGE & Sons, Ltd. London, 1937.

The announcement in 1899, that the tribes of central Australia had no knowledge of the relation between coition and parturition, called attention to a most interesting feature of the *Weltanschauung* of these aborigines. In spite of the fact that the human groups which we label civilized are generally ready to believe the worst of savages, the blackfellows' ignorance of what we consider the cause of pregnancy seemed to require a somewhat excessive stupidity. Continued investigations of the Australians substantiated the original findings, however, and the prevalent belief of anthropologists is that the ignorance of the natives is real and not simulated. Thus, the next question as to what are the observed facts and logical premises upon which the aborigines base their peculiar views assumes a certain importance.

In the first half of his book, Dr. ASHLEY-MONTAGU has summarized the evidence bearing upon this "coming into being" which has been accumulated during the last four decades. While the greater part of the first two hundred pages is composed of excerpts from other workers and is printed in quotation marks, the selections are so wisely made and well organized that the work is a unified whole. The author concludes this portion of the work as follows :

"In the foregoing pages the first-hand accounts of the procreative as well as the related beliefs of the various tribes of Australia have been given in the words of the investigators themselves. From these accounts, I think, it is evident that what has been reported in the majority of instances represents the orthodox doctrine of each tribe, and, with the exception of the aberrant tribes to the north and northeast, it is held according to this doctrine that children are the result of the immigration into a woman of a spirit child which is of an origin going back

into the far distant mythological past. From the variety of contexts in which we have seen these beliefs to function it is clear that their sociological function is to associate a child with a definite pater, actual or classificatory, that is, with the mother's husband, whether or not he is the actual genitor. Thus it is that by means of this belief in the immigration of spirit children into women, the proper totemic and moiety membership of the child is secured. More importantly, an individual is by this means always associated with a definite locality irrespective of where he may have been born, especially, as we have seen, is this the case where the individual is linked to the patrilineal group. There are, of course, local variations in the manner in which these beliefs function but it is clear that they are essentially similar in nature wherever they occur."

The latter half of the book is taken up with a logical evaluation of the facts available to the Australian aborigines, and the author is able to show how completely illogical it would be for the natives to assume that coitus was the cause of pregnancy. Indeed, the philosophically minded reader might be interested in arranging the data of the natives into JOHN STUART MILL's canons of inductive reasoning and in recording the logical conclusions. Needless to say, once this is done, the aboriginal Australian will stand in quite another light. In his surroundings, it is dubious if we could do much better. Scientists today appreciate the necessity for controlling scientific experimentation, but they would probably be unable to design the proper controls for an experimental investigation of the causes of pregnancy in a country where virginity in unknown. When we consider also such complicating factors as the natural sterility of some women regardless of their popularity, the time lag between menarche and fertility, the pre-puberal intercourse which escapes Eve's punishment and the temporal separation of cause and effect by a gestation period, we are forced to the conclusion that the savage is logically correct in discarding copulation as ***the*** cause of generation.

While the Australian looks upon coitus as a contributory condition to pregnancy, that is, it opens up and enlarges the body of the female so that the spirit child may find more comfortable quarters and a readier exit, he holds that it is in no way a primary cause. Once the female organs have been prepared, no matter how young the girl may have been at the time, he believes that any number of spirit children may be received during the following years, and, in due time, produced, even in the absence of any contact between the mother and a male. It is interesting for us to compare this conception of the role of the father with the classical and medieval European ideas on the subject. Even those authorities who believed in pangenesis (ST. AUGUSTINE, ST. THOMAS AQUINAS and others) did not believe that the soul of the child was traduced from the soul of the parents, and in this they were at one with seventeenth century Natural

Theology. The whole evolution-epigenesis controversy is especially revealing and those ovulists who wrote of the *aura seminalis* did not believe that the male made any material contribution to the foetus. The views of the Australian natives are thus not as aberrant as they might appear to be on a superficial examination. It was not until the middle of the nineteenth century, as Dr. ASHLEY-MONTAGU notes, that the union of sperm with ovum was proven to be the regular method of fertilization.

Dr. ASHLEY-MONTAGU has done a real service in collecting the pertinent biological and anthropological literature, and organizing it so that the data secured in the two fields may supplement each other. The foreword by Professor B. MALINOWSKI adds little to the book. Besides stating that the book is good, he attempts to tag and pigeon-hole his colleagues. To the reviewer, who is not an anthropologist, this meticulous classification of the workers in the field into different schools seems needlessly self-conscious. Really the work done by the anthropologists is far more important than the poses they assume while working.

CONWAY ZIRKLE.

Ragnar Numelin. — *The wandering spirit.* A study of human migration With a foreword by Dr. EDWARD WESTERMARCK. xvi + 375 p. London, MACMILLAN and Co., Limited, 1937. Price $7.00.

Peculiar difficulties beset all who enter the field of ecology. Relations exist between different organisms in the same and in different environments which may be ephemeral but determinative of subsequent behavior; which are difficult to treat quantitatively but are nevertheless effective according to their amounts or their attainment of a critical moment; which involve both habit and instinct, or imitation and heredity; and which, as a rule, exhibit the phenomenon of multiple factors the resultant nomogram of which can be computed only when the data are adequate and can be adequately measured. Difficult as animal ecology is, in general, that of *Homo sapiens* is infinitely more complex because individual experience has become a larger factor in behavior than among even the most intelligent animals, and racial experience has established traditions which guide social actions. In the scientific treatment of human migrations there thus arises a need for clarity in the use of terms and uniformity in the elaboration of hypotheses as well as a sharp distinction between fact and inference.

Any research in this field will meet insuperable difficulties due to the lack of quantitative data, the absence of records, the blurring of racial characteristics by hybridizations and interpenetrations of cultural patterns,

and the lack of epidemiological records of the ravages of disease that so often follow upon mass movements of peoples.

The author attempts "a sociological investigation of the factors involved in determining human wandering". Accordingly he turns to present day savages, to primitive peoples in general, to determine whether or not we are entitled to speak of a wandering instinct. He states that the material falls within the spheres of ethnology, sociology, geography, and history. It is noteworthy that he does not include biology, a lacuna all too evident in the entire work.

His discussion falls into fifteen chapters which deal with a brief survey of the historical wanderings of mankind, the theories proposed to explain the phenomenon of human wandering; the wandering of animals; the legends of migrations; the types of wandering peoples, due to cultural stages, food-gathering peoples, fisher and hunter peoples, cattle-breeding and agricultural nomads; transhumance; the geographical factors, such as climate, configuration, water, migration routes, earthquakes, coastal conditions, the sea, and techniques of navigation; robbery, war, politics, colonization, trade, magic, and religion (but not disease); mass wanderings of history and special racial groups such as the gypsies or period outbursts as in the flagellants of the Middle Ages; the inadequacies of the psychoanalytical explanations; the effects of social and religious laxity in fostering migrations; and the function of the subsistence-geographical factor rather than an instinctive impulse as the fundamental cause of human migrations.

The author is clearly dealing with the contrasted biological factors of heredity and environment in relation to human migrations. He is at heart an environmentalist. He stresses food and geographical factors and minimizes genetic or internal (possibly endocrinal) influences in human behavior. At times he accepts the inheritance of acquired characters, a biologically wholly unsound, long since discarded, Lamarckian hypothesis. He fails to make adequate use of the internal instincts of man to combat limitations, interacting with the stimulus of environmental factors. These two combine in the various patterns of human cultures when this age-old animal instinct collides with some stimulus from the environing conditions to induce migration. This stimulus may be not only lack of food but even its abundance. Geographical conditions may impede or favor the flow but can not inhibit the response to the stimulus.

The documentation of this treatise uses a most unscholarly practice in some instances of referring the reader to some 167 periodicals by journal title only but not by citations of authors or titles of papers of significance bearing on the research. The whole work is a rather un-

critical, expanded doctor's thesis, an inadequately organized mass of generalizations on too restricted foundations.

CHARLES A. KOFOID.

H. Munro Chadwick & N. Kershaw Chadwick.—*The Growth of Literature.* Volume I *The Ancient Literature of Europe.* xx+672 pp. Volume II, xx+783 pp. Cambridge : At the University Press; New York : The MACMILLAN Co., 1932 & 1936. 30s each volume.

"Is it possible to trace the operation of any general principles in the growth of literature?" This is the interesting question which the authors have asked themselves and which they set out to answer in this work "by a comparative study of the literary genres found in various countries and languages and in different periods of history."

The authors have sought to treat of such literatures only as seem to have pursued, at least in part, an independent development, and this necessary decision has immediately precluded the utilization of most of the modern literatures of the West. With the origins of literature the authors are not concerned, though they are fully aware of the importance of the subject.

Some twenty-five years ago Professor MUNRO CHADWICK called attention in *The Heroic Age* to many striking analogies in ancient Teutonic and Greek heroic poetry, and in that work he endeavoured to show that these were due to parallel development, arising from similar social and political conditions. What, it would legitimately be expected, held good for one category or genre should also hold good as between others, and this, indeed, subsequent study shewed Professor CHADWICK to be the case. The present work is calculated to be a demonstration of that case.

In the present study Professor CHADWICK and his wife take up the somewhat faded banners of the comparative school and gallantly and commendably set out upon a voyage of discovery which promises to yield results as valuable as they are exciting and which will undoubtedly have the effect of stimulating others to go and do likewise. In the first volume the independent literatures of Europe before the Middle Ages are considered, those of Greece and the Islands (the British Isles and Iceland). In the second volume Russian Oral Literature, Yugo-Slav Oral Poetry (*i.e.* the poetry of the Serbo-Croats), Early Indian Literature, and Early Hebrew Literature are examined. The third and final volume will deal with certain modern oral literatures from Asia, Africa, and the Pacific, and will contain a discussion of the findings resulting from the parallel treatment and examination of these literatures.

Such a heterogeneity of literatures may at first glance appear perplexing,

but it should be at once obvious that if any generally applicable principles emerge from the study of these literatures, the authors' findings must for that reason be all the more convincing. The present two volumes, which constitute the factual materials from which the final inductions will be made, represent a monument of industry and may well prove to be the starting-point of a renaissance of the comparative school in England and America. Thus far the authors appear to be on the right track, and in the present stage of their study the conclusion would seem to be inevitable that there is a high degree of correlation, as the statistician would say, between social and political conditions and the *kind* of literature associated with them. There can, we think, be little doubt concerning the validity of such a conclusion; it is, therefore, with great interest that we look forward to the publication of the third volume of this work, which we hope to discuss at some length in the pages of this journal.

New York University. M. F. ASHLEY-MONTAGU.

Albert Deutsch.—*The Mentally Ill In America. A History of Their Care and Treatment from Colonial Times.* With an Introduction by WILLIAM A. WHITE. xvii+530 pp., 8 illustrations. DOUBLEDAY, DORAN & Company, Inc., New York, 1937. ($ 3.00).

Progress in medicine throughout the ages has been seriously hampered by superstitious beliefs and by non-rational restrictions on investigation and interpretation, and no branch of medicine has suffered more from the general cultural background than that branch which deals with the mentally afflicted. At the present date the general attitude of the community and even of the medical profession towards the insane still shows the persistence of primitive and mediaeval customs and beliefs. The psychiatrist himself must make a considerable effort to free himself from the influence of these residual attitudes which form part of the culture in which he lives. There cling to the language which he is forced to use disturbing traces of magical beliefs, of traditional misinterpretations and scholastic psychology. It is difficult for him to study man as a living individual with a complex inner experience and external personal relations in a thoroughly objective way and to present his results in unequivocal language.

In this book the author is not so much concerned in tracing historically the development of scientific knowledge of mental disorders and their underlying mechanisms as in dealing with the history of the care and treatment of mental patients in America during the last one hundred and fifty years. The two topics are intimately related, for ignorant and superstitious beliefs as to the nature of these disorders were to a large extent the cause of the unsympathetic and brutal treatment of

mental patients, while the conditions under which these patients were observed made it impossible to study the basal nature of the disorder and to separate the symptoms of disease from those reactions due to the inhuman treatment.

The author is a layman and writes as a social historian, but he has taken care when dealing with the more technical medical aspects of his subject to have the advice of a number of specialists who were delighted to be of service to him in a task of such great social value. The preparation of the work was made possible by a grant from the American Foundation for Mental Hygiene, a foundation intimately associated with the work of the National Committee for Mental Hygiene. The book is very readable, consists of twenty-one chapters, each of which discusses a phase, a period, or a personality in the setting of the main topic.

In the first chapter there is a brief review of the earlier historical background, with references to the enlightened views of various early Greek physicians (HIPPOCRATES, ARETAEUS, SORANUS) and their later submergence for centuries by crude superstitious and religious beliefs which involved the harsh and brutal treatment of the insane. During this period of obscurantism the earlier Hellenic outlook was partly preserved in Arabic culture. In the general darkness of many centuries there were foci of light, isolated voices, the forerunners of a modern outlook (PARACELSUS, JOHANN WEYER of Cleves, REGINALD SCOT), individual establishments guided by kindness and charity (Gheel). Colonial America shared the European heritage and the Salem witchcraft episode illustrates the beliefs and behaviour of our predecessors. In America, as in Europe, it was only towards the end of the 18th century that a new humanitarian note is clearly heard and elicits a response. BENJAMIN RUSH is the name most familiarly associated with this awakening in America, as one associates the name of CHIARUGI in Italy, of TUKE in England, of PINEL in France.

The end of the 18th century represents the beginning of a new epoch in the assertion of humanitarian principles, in the establishment of institutions, in the actual conception of mental disorders. The Society of Friends under the influence of TUKE opened their Retreat at York, in England, in 1796; the same impulse established the Friends' Asylum at Frankford, Pennsylvania in 1817, the Hartford Retreat in Connecticut in 1822, and induced general hospitals in Philadelphia, New York and Boston to offer accommodations to the mentally sick as well as to the bodily sick.

Throughout the 19th century we see the steadily increasing acceptance of the claims of the mentally sick and the recognition by the community

of its responsibility for making suitable arrangements for their careful study, care and treatment. This movement is illustrated by the gradual establishment throughout the states of the necessary institutions for this purpose (Virginia had in 1773 opened the first American hospital for the insane). How slow was the progress of a decent and humanitarian view of these problems is illustrated in the memorial presented to the Legislature of Massachusetts by DOROTHEA LYNDE DIX in 1843 with its detailed account of the actual state of the insane.

Along with the development of institutions suitable for the treatment of the mentally sick, and with the better organization of the community for their care, went the introduction of the study of mental disorders into the medical curriculum, and an increased interest in the investigation of the nature of mental disorders. Thus in the latter half of the 19th century psychiatry began to take its due place among the regular medical studies.

As to scientific investigation of mental disorders, at first the methods were almost exclusively the traditional methods of the other medical disciplines, the anatomy and physiology of the brain were eagerly studied, underlying metabolic and infectious disorders were looked for. It was only at the end of the century that interest began to be directed more systematically to the intrinsic problems of psychiatry, those concerned with the organization of the personality and with the interaction between the personality and the environment.

As the material provisions for the care of the insane improved and began to conform to decent notions, so the regulations which dominated the situation became more appropriate to conditions of sickness and began to lose their kinship with the regulations dealing with delinquency and crime. It is striking to realize, however, that even as late as the 20th century mental patients in Washington, D. C., continue to be accused and placed on trial on a charge of insanity, the case being disposed of in court. At the date of the writing of this book it has not yet been possible to eliminate the mandatory jury trial law with regard to insanity in the District of Columbia. In general, however, the administrative machinery for dealing with problems of mental disorder has been made much more rational and adapted to problems of health, and at the same time throughout the whole community there has been the dissemination of information with regard to the problems of mental health and some modification of the traditional attitude towards these disorders.

The most important single factor with regard to the education of the community in this field has been the establishment of The National Committee for Mental Hygiene organized in 1909 under the influence

of CLIFFORD W. BEERS, a graduate of Yale University, who had passed through a long and stormy mental illness.

The author takes up the various topics mentioned in chapters which are full of detailed information and well documented. He presents the growing humanitarian interest in the problem, the organization of suitable institutions, the evolution of a specialized medical personnel, the growing importance of the study of mental disorders in the medical curriculum, the special lines of investigation which have been dominant at various periods and those which are at the present time being profitably followed.

The book is an interesting presentation of the evolution of American thought and action in regard to an important cultural problem from Colonial times to the present.

Harvard Medical School. C. MACFIE CAMPBELL.

Henry E. Sigerist. — *American Medicine.* Translated by HILDEGARD WAGEL ixi + 316 pp., 30 illus. W. W. NORTON & Company, Inc. New York. 1934 ($4.00).

Henry E. Sigerist. — *Socialized medicine in the Soviet Union.* 378 pp., 26 illus. W. W. NORTON & Company, Inc. New York. 1937 ($3.50).

In the epilogue of his work on American Medicine, Professor SIGERIST who needs no introduction to readers of *Isis*, foreshadows the second of these volumes, on Soviet Medicine, and thereby invites comparison. "The United States of America and the Union of Socialist Soviet Republics to-day are the two countries that are experimenting in the medical field and are seeking new forms of medical service. They, first of all, will determine the future of medicine".

The earlier of these volumes, on *American Medicine*, initially published in German, was the outcome of a lecture tour made by the author through the United States prior to taking up the professorship of the History of Medicine at the Johns Hopkins University. As a preliminary to a discussion of the social and general problems of contemporary medicine, which are closely integrated with their historical development, the author traces in the first half of the volume, the growth of medicine from primitive times, through the colonial period to the immediate past. With a tempo, which at times is almost reportorial, the immensity and rapidity of this growth is well expressed. In this section appears a series of attractive thumb-nail sketches on MORGAN, RUSH, MCDOWELL, DRAKE, BEAUMONT, GROSS, SIMS, HOLMES, WEIR-MITCHELL, BILLINGS and OSLER.

We are then carried into American medicine of the present. It is largely in this section that there is much to which exception will be taken.

In part this is no doubt related to the fact that Professor SIGERIST is dealing with questions in contemporary rather than in historical perspective. The author treats of Medical Education, emphasises the importance of the establishment of the Johns Hopkins University Medical School as a model in the elevation of standards, and outlines the method of license, a practice which, he suggests with much point, should again be entrusted to the medical schools.

The author gives perhaps too much credit to the work of ABRAHAM FLEXNER in bringing about reforms in medical education without mention of the solid work done by the American Medical Association in this regard. There is likewise undue emphasis on the Hopkins plan with its full-time system which constitutes the exception rather than the rules.

The development of group practice, the Mayo Clinic, the costs of medical care, and cultism, contribute to a discussion on the physician and patient. The author touches upon the important question of medical care through health insurance — a solution which has met with considerable though irrational resistance, due in part to the fear that any such system will become a political football. A feature of this resistance, familiar to the reviewer, is due as Professor SIGERIST says, to an incorrect appreciation of European insurance experiments. While recognizing that limited health insurance is but a compromise, he advocates an all-embracing system for the entire community.

Hospitals, nursing, preventive medicine and some of the achievements of medical science are described and the volume closes with a graceful tribute to WELCH. A useful bibliography is appended.

In this work on American Medicine, Professor SIGERIST has covered the subject by means of the historical approach, largely from the point of view of positive achievement. Unfortunately no critical analysis follows, consequently a true picture cannot be reflected nor the trends which are moulding contemporary thought assessed. He creates in the mind of the reader an impression of too-ready acceptance of local opinion as authoritative, hence the sociology is amateurish. From one of Professor SIGERIST's wide experience we had hoped for something more constructive. However it must not be forgotten that this work was written initially for the German reader and in consequence is to a certain extent interpretative.

In the second of these companion volumes the author informs us that he is more concerned with the basic idea of socialized medicine, dependent as it is upon a definite philosophy with a definite goal — the development of a socialized as a step towards a communist society. This is succinctly indicated in the title of the work, *Socialized Medicine in the Soviet Union*. The great rapidity with which things change in the Soviet Union and in

consequence become as rapidly outmoded made constant revision of the volume necessary, despite the very recent visit of Professor SIGERIST to Russia, and led to his emphasis on the importance of keeping in mind the theory of dialectic materialism on which the Soviet system is based. The author feels that the majority of his medical readers will be unfamiliar with Marxian philosophy and therefore opens this work with a brief presentation of its leading ideas. In this brief outline, admittedly sketchy, the author might have given more prominence to the idea of the "dictatorship of the proletariat", to quote from MARX, for it occupies a key position in the theory of Communism and serves to clarify the dual system of government of which we find so much evidence in this study. The author emphasises and appears to accept the special relationship which the Marxian system bears to history and its interpretation, the so-called method of historical materialism. Yet many responsible thinkers fully recognizing that economic factors have played an important part in all periods of the world's social development, regard the exaggerated economic interpretation of history formulated by MARX and ENGELS as the weak spot of their political system. There are influences far more subtle.

The opening chapter completes the background with a discussion of the Revolution and the new social order. A brief history of early folk, court and Zemstvo medicine leads to the principles of Soviet medicine.

In the mind of the author the most characteristic features of the Soviet health system can be expressed very simply because like all other aspects of the socialist state they are so "rational, logical and clear". "It seems to me that the following four points represent the most characteristic features of the Soviet health system : (1) Medical service is free and therefore available to all. (2) The prevention of disease is in the foreground of all health activities. (3) All health activities are directed by central bodies, the People's Commissariats of Health, with the result that (4) health can be planned on a large scale".

The organization of Soviet medicine is thoroughly covered in chapters on the organs of administration, group protection and the protection of the individual, with a final chapter on Science and Research.

Statistics, regulations and tables of organization, some of which are relegated to an appendix, are freely used, derived for the most part from official publications and from newspapers such as *Pravda* and *Izvestia*. All illustrations with the exception of a portrait of PAVLOV, are acknowledged as from the official agency Sovfoto.

Professor SIGERIST's account of Soviet medicine gives some idea of the enormous progress that has been made in the establishment of a sound health service, the control of epidemics, the creation of health

resorts, sanatoria and hospitals, the decrease in the morbidity of disease and of infantile mortality. The progress made is amazing and startling particularly when one takes into account the fact that the Soviet Union had to face so many disadvantages in all spheres and to begin practically from scratch. The author confesses that as yet the accomplishments are incomplete and that further energetic plans for extension are in the making. It would seem that the crying need at the moment is quantity, though it must be difficult to assess the quality except possibly in the show places. Perfection could scarcely be expected in the twenty odd years since the Revolution.

As previously mentioned the author is more concerned with the basic idea of socialized medicine, so we find perhaps more emphasis on the plan and the organization constituting a single unit for the population than on such inadequacies as may exist.

"I have not stressed inadequacies and inefficiencies in this book, nor have I wasted time in describing poor institutions. I have been primarily interested in the principles of Soviet medicine and in those positive achievements which represent a permanent gain. Shortcomings will be remedied sooner or later. My method in this book was like that in the one on American medicine. There, also, I could have written many pages on poor institutions, on the practice of fee-splitting, and other dark aspects of American medicine. I omitted them for the same reason because I was convinced that only the positive achievements of American medicine would in any way enrich the world".

The fundamental concepts, the plan and its workings are clearly described and competently handled. The basic principles of the plan are well conceived and directed and in this respect the system approaches the ideal. In the opinion of Dr. SIGERIST and of all recent writers, great faith, discipline and passionate belief in their mission are striking characteristics of those concerned with the carrying out of the organization of Soviet medicine, though many of them are recognized as belonging to the "middle medical personnel", trained in so-called technicums. Conditions have forced use still to be made of the half-trained "Feldscher" for as yet the medical schools have not coped with the quantitative demands for more and better trained doctors and the curricula and the medical schools are still experimental. Professor SIGERIST well imparts the enthusiasm of those concerned. However, any plan, no matter how perfect, depends for its ultimate consummation on its personnel.

The reviewer feels that at times Professor SIGERIST is somewhat carried away by his obvious enthusiasm for the plan. The world is watching the course of the whole Russian experiment, conscious that its own destiny may depend on the outcome.

University of California, JOHN B. DE C. M. SAUNDERS.

Fifty-third Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization

(*to end of January* 1938—*with special reference to sections* 31 *to* 33)

This fifty-third bibliography contains about 540 items of which 95 deal with sections 31 to 33. They have been kindly contributed by the fifteen following scholars belonging to four different countries:

C. W. ADAMS (Hertford, England)
M.F.ASHLEY-MONTAGU (New York)
T.L. DAVIS (Cambridge, Mass.)
L. GUINET (Brussels)
H. HARRIS (San Francisco)
A. C. KLEBS (Nyon, Switzerland)
C. A. KOFOID (Berkeley, Calif.)
R. K. MERTON (Cambridge, Mass.)
J. PELSENEER (Brussels)
A. POGO (Washington, D.C.)
S. SAKANISHI (Washington, D.C.)
G. SARTON (Cambridge, Mass.)
J.B. de C.M. SAUNDERS (S. Francisco)
M. C. WELBORN (Cambridge, Mass.)
C. ZIRKLE (Philadelphia).

This Bibliography includes as usual a series of addenda and errata to SARTON's *Introduction to the History of Science*, vols. 1 and 2 (Baltimore and London, 1927 and 1931). Its purpose and methods have been explained in the preface to the 38th Critical Bibliography, (*Isis* 20, 506-08).

Sections 31 to 33 dealing with geography, geology, and meteorology are especially full, as I have liquidated as much as I could of my stock of notes concerning them.

I have in my drawers a large number of notes which I will be glad to publish as soon as I have been able to check them upon the originals.

The Historical and racial classification (Part II) contains a new section (IV), " The New World and Africa " divided into three subsections (a) America, (b) Oceania, (c) Africa. (These subsections have not been numbered in order not to distrub the numbering of sections of Part III).

I entreat the authors of relevant books and papers to send me copies of them *as promptly as possible* in order that their studies may be registered in this bibliography and eventually reviewed and discussed. By so doing they will not simply help me and every other historian of science but they will help themselves in the best manner for they will obtain for their work the most valuable publicity and its certain incorporation into the literature of the subject.

Many of the notes were checked and the final manuscript and proofs of this Critical Bibliography were kindly read by Dr. M. C. WELBORN.

Harvard Library, 185. GEORGE SARTON.
Cambridge, Mass. Feb. 16, 1938.

PART I

FUNDAMENTAL CLASSIFICATION (CENTURIAL)

IXth century B.C.

Schultze, Ernst. Die Zahlensysteme der homerischen Griechen. *Archeion* 19, 179-91, 1937. ISIS

VIth century B.C.

Heidel, William Arthur. HECATAEUS and the Egyptian priests in HERODOTUS, Book II. *Memoirs of the American academy of arts and sciences* 18, pt. 2, 53-134, Boston, 1935. ISIS

Hu Shih. A criticism of some recent methods used in dating Lao Tzu. *Harvard journal of Asiatic studies* 2, 373-97, 1937. ISIS

Vth century B.C.

Diepgen, Paul. Haben die Hippokratiker den Blutkreislauf gekannt? *Klinische Wochenschrift* 16, 1820-23, 1937. ISIS

Souques, A. La douleur dans les livres hippocratiques. Diagnostics rétrospectifs. *Bulletin de la société française d'histoire de la médecine* 31, 209-44, 1937. ISIS

IVth century B.C. (second half)

Aristotle. I. Parts of animals. II. Movement of animals. III. Progression of animals. Foreword by F. H. A. MARSHALL. 556 p. (Loeb classical library.) Harvard University Press, 1937 ($2.50). ISIS

In this latest addition to the Loeb classical library, the three-hundred-and-twenty-third volume in the series, the *De partibus animalium* is made available in a new and most excellent translation by A. L. PECK of Christ's College, Cambridge. The not less excellent translation of the *De incessu animalium* and the *De motu animalium* is by E. S. FORSTER of the University of Sheffield. The three treatises are morphological with especial emphasis placed upon the functional characters of animals. That one man in a single life-time could have learned so much concerning the nature of animals as

is recorded in this volume alone seems to me incredible, and the conclusion is increasingly forced upon one that ARISTOTLE was not one man but many. It is quite possible that, like HERBERT SPENCER in a later age, ARISTOTLE employed an army of workers to gather his facts for him, and that when these were brought in they were analysed and organised by himself the "master mind." The glory is his, and the undying admiration of all mankind. M. F. A.-M.

Cooper, Lane. The verbal "ornament" (*κόσμος*) in ARISTOTLE's art of poetry. *Studies in honor of E. K. Rand*, 61-77, 1938. ISIS

Drabkin, Israel E. Notes on the laws of motion in ARISTOTLE. *American journal of philology* 59, 60-84, 1938. ISIS

"In examining ARISTOTLE's attempts to represent quantitatively certain phenomena of nature, we have seen wherein his shortcomings lay. We have seen that from one point of view success was impeded not by insufficient observation and excessive speculation but by too close an adherence to the data of observation and by insufficient analysis and insufficient abstraction, a condition which was not overcome until two thousand years later." ... "We may think of ARISTOTLE as having joined to the deductive and mathematical analysis of Platonic science a realization that the validity of a science of nature is ultimately tested by empirical observation. We see in ARISTOTLE's work an appreciation of the importance of abstraction, an attempt, though hesitant and incomplete, to look beyond the mere description of phenomena, to the formulation of mathematical equations applicable to physical relations, even the groping toward a simplicity postulate in the use (and abuse) of proportionality in the formulations. From one point of view, that portion of the scientific corpus of ARISTOTLE which is concerned with the classification and the report of observations is most valuable; but, from another point of view, the attempt to do what ARISTOTLE recognizes as necessarily involving a lesser degree of certitude, to organize and systematize this knowledge, to find underlying principles, and to bring all together under an integrated view of all existence is of even greater significance."

Strömberg, Reinhold. Theophrastea: Studien zur botanischen Begriffsbildung. Göteborgs K. Vet.-och Vitterhets-Samh. Handl. ser. A., 6(4), 1-234, 1937. ISIS

Contains a brief sketch of Grecian botany at the time of ARISTOTLE and THEOPHRASTOS, and a detailed study of the technical botanical vocabulary of the latter. There is also an excellent classified bibliography of 18 pages and indices of Greek words, topics and plant groups. C. Z.

Wilhelm, Richard (1873-1930), Liä Dsi: Das wahre Buch vom quellenden Urgrund (Tschung hü dschen ging). Die Lehren der Philosophen LIÄ YÜ KOU und YANG DSCHU. Aus dem Chinesischen

verdeutscht und erläutert. 3. Aufl. XXXIII+175 p. Jena, DIEDERICHS, 1936. ISIS

Reviewed by W. EICHHORN, *OLZ* 41, 51, 1938. The first edition of this book (Jena 1911) was reviewed in *Isis* 1, 119. It deals with the mysterious work and personality of LIEH TZU (*Intr.* 1, 138). The new edition contains a preface by HELLMUT WILHELM; it is not up to date. G. S.

IIIrd century B.C. (second half)

Davis, Tenney L. The Jofuku shrine at Shingu, a monument of earliest alchemy. *Nucleus* 15, 3 p., 3 illus., 1937. ISIS

Davis, Tenney L.; Nakaseko, Rokuro. The tomb of JOFUKU or JOSHI, the earliest alchemist of historical record. *Ambix* 1, 109-15, 2 pl., 1937. ISIS

Apropos of HSÜ SHIH (4748, 9905) who flourished under the Ch'in emperor SHIH HUANG TI, who ruled from 221 to 209 (not 259 to 210). G. S.

IInd century B.C. (second half)

Morgan, Evan. Tao, the great luminant. Essays from HUAI NAN TZŬ with introductory articles, notes, analyses. Foreword by J. C. FERGUSON. XLV+291 p. London, KEGAN PAUL (1936?). ISIS

Reviewed by TENNEY L. DAVIS, *Isis* 27, 504-07, 1937.

Ist century B.C. (whole and first half)

Leon, Harry Joshua. Astronomy in LUCRETIUS. *Studies in honor of E. K. Rand*, 163-76, 1938. ISIS

"We should have expected therefore that a man of such ardent scientific interests as LUCRETIUS displays in his great poem would be fully abreast of the most advanced astronomical knowledge of his day. Actually, however, his interpretations of astronomical phenomena are for the most part distressingly naive and hardly worthy, we should suppose, of a thinker who could expound such doctrines as the atomic composition of matter, the indestructibility of matter, the evolution of animal and human forms and of human civilization, and, nineteen centuries before DARWIN, present the rudiments at least of the biological doctrine of the struggle for existence and the survival of the fittest."

IInd century (whole and first half)

Johnston, Edward Hamilton. The Buddhacarita : or, Acts of the Buddha. Part I. Sanskrit text. Part II, Cantos I to XIV

translated from the original Sanskrit supplemented by the Tibetan version, together with an introduction and notes. XX+165 p., XCVIII+232 p. (Panjab University oriental publications, nos. 31, 32.) Calcutta, Baptist Mission Press, 1935-6. ISIS

Reviewed by FRANKLIN EDGERTON, *Journal of the American oriental society*, 57, 422-25, 1937.

IVth century (second half)

Peebles, Bernard M. DA PRATO's Saibantianus of SULPICIUS SEVERUS and its humanistic connections. *Studies in honor of E. K. Rand*, p. 231-44, 1938. ISIS

Vth century (whole and first half)

Gossen, Hans. Die zoologischen Glossen im Lexikon des HESYCH. *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 7, 1-154, 1937. ISIS

Keenan, Mary Emily. AUGUSTINE and the medical profession. *Transactions of the American philological association* 67, 168-90, 1936. ISIS

"Students of patristic literature have long been cognizant of the thorough acquaintance of the Fathers of the Church with medicine and medical works. Thus, for example, HARNACK in the eighth volume of his *Texte und Untersuchungen zur Geschichte der Altchristlichen Literatur*, discusses very ably the knowledge of medicine and surgery among the early Christians. PEASE, confining himself to a single writer, has assembled and evaluated the allusions to medicine in the works of JEROME. The writings of AUGUSTINE, however, have not been drawn upon to any great extent for information of this kind, and since allusions to the medical profession are numerous in his works, it has seemed worth while to assemble the more striking and characteristic."

Pickman, Edward M. The mind of Latin Christendom. IX+739 p. Oxford University Press, 1937 ($ 5.00). ISIS

The book will be reviewed in *Isis*.

VIth century (whole and first half)

McKinlay, Arthur Patch. The *De syllogismis categoricis* and *Introductio ad syllogismos categoricos* of BOETHIUS. *Studies in honor of E. K. Rand*, 209-19, 1938. ISIS

VIIth century (whole and first half)

Bingham, Woodbridge. WÊN TA-YA : the first recorder of T'ang history. *Journal of the American oriental society* 57, 368-74, 1937. ISIS

Friedman, Reuben. ZAU-YUN-FANG (CH'AO YUAN-FANG). Discoverer of the Acarian origin of scabies? *Medical life* 44, 331-32, 1937. ISIS

Hilgenberg, Luise ; Kirfel, Willibald. VĀGBHAṬA's *Aṣṭāṅgahṛdaya-saṃhita*. Ein altindisches Lehrbuch der Heilkunde. Aus dem Sanskrit ins Deutsche übertragen mit Vorwort, Anmerkungen und Indices. *Janus* 41, 115-44, 186-223, 294-320, 1937 (to be continued). ISIS

Taylor, F. Sherwood. The alchemical works of STEPHANOS OF ALEXANDRIA. Translation and commentary. *Ambix* 1, 116-39, 1937. ISIS

" The long and important alchemical treatise of STEPHANOS OF ALEXANDRIA has hitherto been inaccessible to the general reader, since it is not included in BERTHELOT's *Collection des anciens alchimistes grecs*. The whole Greek text is printed only in the rare *Physici et medici Graeci minores* of IDELER; portions are contained in other yet rarer works. The present study of the alchemical work of STEPHANOS will include (1) Introduction, (2) the Greek texts from IDELER with variants from MS. Marcianus Graecus, 299, (3) an English translation, (4) commentary, (5) bibliography." See SARTON's *Introd.* (1, 472.)

VIIIth century (whole and first half)

Jones, Charles W. Manuscripts of BEDE's *De natura rerum*. *Isis* 27, 430-40, 1937. ISIS

VIIIth century (second half)

Dobiaš-Roždestvenskaïa, Olga. L'histoire des Longobards, comment fut-elle conçue et achevée? *Studies in honor of E. K. Rand*, 79-85, 1938. ISIS

Levi della Vida, Giorgio. Appunti e quesiti di storia letteraria araba. 6. Un opuscolo astrologico di MÂSÂ'ALLÂH. *Rivista degli studi orientali* 14, 270-81, 1933. ISIS

Apropos of the text *Bâb al-amṭâr fil-sana* (chapter on rains in the year) edited in Arabic from the Cod. Barberiniano 46 with an Italian translation. G. S.

Lowe, Elias Avery. A manuscript of ALCUIN in the script of Tours. *Studies in honor of E. K. Rand*, 191-93, 1 pl., 1938. ISIS

IXth century (whole and first half)

Carey, Frederick M. The scriptorium of Reims during the archbishopric of HINCMAR (845-882 A.D.). *Studies in honor of E. K. Rand*, p. 41-60, 2 pl., 1938. ISIS

Mingana, Alphonse (1881-1937). An important manuscript of the traditions of Bukhârî with nine facsimile reproductions. 45 p., 9 pl. Cambridge, HEFFER, 1936. ISIS

Reviewed by A. GUILLAUME, *Journal of the royal Asiatic society* 155, 1938. Obituary of the author, ibidem, 163-4.

IXth century (second half)

Luckey, P. THÂBIT B. QURRA's Buch über die ebenen Sonnenuhren. *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*, Abtg. B : Studien, 4, 95-148, 1937. ISIS

Elaborate study of THÂBIT IBN QURRA's treatise on plane sundials (*Kitâb fî âlât al-sâ'ât al-latî tusammâ rukhâmât*) of which KARL GARBERS published recently (1936; *Isis* 27, 120) an edition and German translation. The author has taken pains to explain THÂBIT's ideas in modern form. G. S.

Ruska, Julius. AL-RÂZÎ's Buch Geheimnis der Geheimnisse. Mit Einleitung und Erläuterungen in deutscher Übersetzung. XIII+ 246 p., 5 fig. (*Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 6). Berlin, SPRINGER, 1937. ISIS

Reviewed by GEORGE SARTON, *Isis* 27, 506-07, 1937.

XIth century (whole and first half)

Levi della Vida, Giorgio. Appunti e quesiti di storia letteraria araba. 4. Due nuove opere del matematico al-Karagī (al-Karhī). *Rivista degli studi orientali* 14, 249-64, 1933. ISIS

Important contribution to the study of the great mathematician AL-KARKHÎ (*Intr.* 1, 718), whose name—the author claims—should be read AL-KARAJÎ). G. S.

Ünver, A. Suheyl. L'article d'AVICENNE sur la chicorée. 29 p., figs. Istanbul, " Kader," 1937 (en turc avec réeumé français). ISIS

Édition en arabe avec traduction turque et résumé français de l'article d'AVICENNE sur la chicorée (hindiba). Cet article avait été composé par lui " en réponse à la question : ' Faut-il laver ou non les feuilles de la chicorée avant de l'employer en médecine ' ? Il est lui-même et d'après des raisons logiques, d'avis à ce qu'elles soient employées sans être lavées et en explique les causes." ... " Cet article sur la chicorée constitue un exemple important de la finesse et de l'importance donnée aux détails par la médecine musulmane et turque en Orient il y a 9-10 siècles. Il contient, en outre, des données importantes sur la colchique, le coriandre et la camomille." G. S.

Ünver, A. Süheyl. Büyük türk hekimi ve feylesofu IBNI SINA (AVICENNE) 980-1037. 21 Haziran 1937, 900 cü yili ihtifali hatirasi. Istanbul Üniversitesi tib tarihi enstitüsü, Adet : 8, 1937. ISIS

Belle collection d'articles publiés avec de nombreux facsimilés et d'admirables illustrations en couleurs pour célébrer le neuvième centenaire de la mort d'AVICENNE. G. S.

XIth century (second half)

Inostrantsev, C. A cryptogram of KHAYYAM. *Journal K. R. Cama oriental institute* no. 27, 61-2, 1935. ISIS

Williamson, H. R. WANG AN SHIH. Vol. 2, 424 p. London, PROBSTHAIN, 1937. ISIS

Reviewed in *Journal of the American oriental society* 57, 440-42, 1937. For vol. 1, 1935 see *Isis* 25, 192.

XIIth century (whole and first half)

Millàs Vallicrosa, José. The (astronomical) work of PETRUS ALFONSUS. *Tarbiz* 9, 55-64, Jerusalem, 1937 (in Hebrew). ISIS

Ross, Sir Denison. Arab map of the British Isles. *Antiquity* 11, 341-42, 2 pl., 1937. ISIS

Ross, James Bruce. A study of twelfth-century interest in the antiquities of Rome. *Medieval and historiographical studies in honor of James Westfall Thompson* p. 302-21, 1938. ISIS

Spies, Otto. Three treatises on mysticism, by SHIHÂBUDDÎN SUHRAWARDÎ MAQTÛL. With an account of his life and poetry. Edited and translated by OTTO SPIES and S. P. KHATAK. 52 plus 121 p.

(*Bonner orientalistische Studien*, 12). Stuttgart, KOHLHAMMER, 1935. ISIS

Reviewed by R. A. NICOLSON, *Journal of the Royal Asiatic Society* 716-17, 1937. See *Introduction* (vol. 2, 361).

XIIth century (second half)

Corner, George W. Salernitan surgery in the twelfth century. *British journal of surgery* 25, 84-99, 54 fig., 1937. ISIS

Jones, Leslie Webber. The library of St. Aubin's at Angers in the twelfth century. *Studies in honor of E. K. Rand*, 143-61, 1938. ISIS

Joranson, Einar. The Palestine pilgrimage of HENRY THE LION. *Medieval and historiographical studies in honor of James Westfall Thompson*, p. 146-225, 1938. ISIS

XIIIth century (second half)

Boüard, Michel de. Une nouvelle encyclopédie médiévale : Le compendium philosophiae. 206 p. Paris, BOCCARD, 1936. ISIS

The author has examined the MSS of that anonymous *Compendium*, studied its sources, and various aspects of it : classification of sciences, theology, cosmology, study of living beings, physics. He concludes that the *Compendium* was written after ST. THOMAS' death but before the end of the century (i.e., 1274-1301) and that the author was deeply influenced by ALBERT THE GREAT. Who was the author? Perhaps a countryman of the Dominican ULRICH ENGELBERT OF STRASSBURG, who died in 1277 (*Introd.* 2, 944), to wit, HUGH RIPELIN author of the *Compendium theologiae* which is associated with the *Compendium philosophiae* in two MSS. Indeed these two compendia have many points in common (see p. 116). The second half of BOÜARD's book (p. 126-206) contains a number of extracts from the *Compendium philosophiae*, after the Paris ms. the explicit of which is dated 1320. G. S.

Chodos, I. FALAGUIERA's manuscript " versified vademecum on the care of body and soul." *Harofé haivri, The Hebrew medical journal* 2, p. 150-70, 1937 (in Hebrew). ISIS

Constantinowa, Alexandra. Li tresors of BRUNETTO LATINI. *Art Bulletin* 19, 203-19, 24 fig., 1937. ISIS

Study of the Leningrad French illustrated thirteenth century ms. G. S.

Herriott, J. Homer. The " lost " Toledo manuscript of MARCO POLO. *Speculum* 12, 456-63, 2 pl., 1937. ISIS

Koch, Joseph. Das Gutachten des AEGIDIUS ROMANUS über die Lehren des PETRUS JOHANNIS OLIVI. Eine neue Quelle zum Konzil von Vienne (1311-1312). *Scientia sacra, Theologische Festgabe für Kardinal Schulte*, 142-68, Köln, BACHEM (received Nov. 1937). ISIS

Thomson, S. Harrison. ROBERT KILWARDBY's commentaries *In Priscianum* and *In barbarismum Donati*. *New Scholasticism* 12, 52-65, 1938. ISIS

XIVth century (whole and first half)

Dewert, Jules. Calendrier hennuyer au XIV^e^ siècle. *Le folklore brabançon* 17, 77-81, 1937. ISIS

Koch, Joseph. Der Prozess gegen den Magister JOHANNES DE POLLIACO und seine Vorgeschichte (1312-1321). *Recherches de théologie ancienne et médiévale* 5, 391-422, 1933. ISIS

" NOËL VALOIS hat dem bedeutenden Theologen JOHANNES DE POLLIACO (JEAN DE POUILLY) in *Histoire littéraire de la France* 34 (1914) 220-281 eine in vielen Punkten ausgezeichnete Abhandlung gewidmet und ihr naturgemäss auch seinen Prozess eingehend behandelt. Trotzdem dürfte es notwendig sein, diesen ideengeschichtlich bedeutsamen Prozess erneut darzustellen, da VALOIS eine Anzahl von Quellen, die den Verlauf der Sache und die innern Zusammenhänge weithin aufklären, nicht benutzt hat."

Lippmann, Edmund O. von. DANTE's Schrift " Über Meer und Festland." Quaestio de aqua et terra. *Geistige Arbeit*, Berlin, 5. Juli, 1937, 4. Jhg., Nr. 13, p. 3-4. ISIS

" Wie die vorstehende kurze Übersicht erweist, zeigt sich DANTE auch in dieser Abhandlung als durchaus freier und vorurteilsloser Geist; betreffs einiger wichtiger Punkte knüpft er zwar an ARISTOTELES an, betreffs anderer (Einflüsse der Gestirne und Dämpfe) an RISTORO und ALBERTUS MAGNUS (1200-1280), stets aber bleibt sein Urteil selbständig, und viele seiner Ansichten nehmen solche vorweg, die erst zu erheblich späteren Zeiten, in ihnen allerdings weit eindringlicher, aufgestellt und entwickelt wurden, so durch LIONARDO DA VINCI. Mit diesem teilt DANTE vor allem die unbedingte Wertschätzung der Erfahrung, die die meisten Gelehrten und Naturforscher seines Jahrhunderts noch weitgehend vernachlässigten."

Welborn, Mary Catherine. The long tradition : a study in fourteenth-century medical deontology. *Medieval and historiographical studies in honor of James Westfall Thompson*, p. 344-57, 1938. ISIS

" By examining some of the principal works of representative doctors of the fourteenth century, we can come to certain definite conclusions concerning the rise and development of contemporary medical ethics and, what is more precious, to a better understanding of the fourteenth century doctor, who has been so reviled by famous writers like PETRARCH and by other humanists."

XIVth century (second half)

Bergendoff, Conrad. A critic of the fourteenth century : St. BIRGITTA of Sweden. *Medieval and historiographical studies in honor of James Westfall Thompson*, p. 3-18, 1938. ISIS

Herben, Stephen J., jr. Arms and armor in CHAUCER. *Speculum* 12, 475-87, 1937. ISIS

Talbert, Ernest William. The date of the composition of the English Wyclifite collection of sermons. *Speculum* 12, 464-74, 1937. ISIS

XVth century (whole and first half)

Diller, Aubrey. A geographical treatise by GEORGIUS GEMISTUS PLETHO. *Isis* 27, 441-51, 1937. ISIS

Koch, Josef. Cusanus-Texte. 1. Predigten. 2./5. Vier Predigten im Geiste ECKHARTS. Lateinisch und deutsch, mit einer literar-historischen Einleitung und Erläuterungen. Vorgelegt von ERNST HOFFMANN. 211 p. (*Sitzungsberichte der Heidelberger Akademie der Wissenschaften*, philosophisch-historische Kl., 2, 1936/37). Heidelberg, WINTER, 1937. ISIS

Lockwood, Dean P. In domo RINUCII. *Studies in honor of E. K. Rand*, 177-90, 1 pl., 1938. ISIS

" In the twenty-five years that have elapsed since my initial study of RINUCCI, there have come to my attention four manuscripts associated in one way or another with RINUCCI himself and with a group of scribes who were under his supervision. These manuscripts not only throw new light on the character and activities of RINUCCI, but also contribute a bit of chiaroscuro to the picture of humanism as a whole.

XVth century (second half)

Barbosa, António. JOSÉ VIZINHO, autor do " Regimento do Estrolabio." *Petrus Nonius* 1, 19-48, 1937. ISIS

Klebs, Arnold C. Incunabula scientifica et medica. *Osiris* IV, 1-360, 1937 (wrongly dated 1938, which is the date of the completed vol. IV). ISIS

Carefully selected list of some 3000 editions of some 1000 titles. I shall discuss it very elaborately in a special memoir to appear in *Osiris* V.
Reviewed in *Bulletin of the medical library association* 26, 107-09, 1937. G. S.

Borlandi, Franco. El libro di mercatantie et usanze de' paesi. VI+ 212 p., pls. (*Documenti e studi per la storia del commercio e del diritto commerciale italiano*, 7). Torino, LATTES, 1936 (25 L.). ISIS

Sixth edition of the commercial treatise of GIORGIO DI LORENZO CHIARINI, the first to appear in print (Florence 1481) with elaborate introduction and glossaries. The work was done independently of ALLAN EVANS' on PEGOLOTTI's *Practica della mercatura* (Mediaeval Academy, Cambridge, Mass., 1936)—but there is a cryptic reference to it in the preface. G. S.

Creutz, Rud. PANTALEON DE CONFLUENTIA, ein Koblenzer Arzt des 15. Jahrhunderts. *Med. Welt* no. 48, 8 p., 1937. Cf. *Mitt. z. Gesch. d. Med., Naturw. u. Techn.* 37, 7, 1938. ISIS

Though WICKERSHEIMER in his excellent *Dict. biograph. du moyen âge* (1936, p. 591) has given a very full account of this man with very precise bibliographic references to his work and the many articles about him, Dr. CREUTZ has seen fit to ignore all that in order to congratulate the city of Koblenz, on the occasion of the meeting there held by the German Soc. Hist. Med. and Nat. Sciences for the production of this "herrliche Sohn." It is rather surprising that none of the historians present to discuss this paper, called attention to the fact that *Confluentia* in old geography does not indicate only the spot where the Mosel falls into the Rhine, but that there are many others, among which one *Confienza*, a few miles from Vercelli in Piedmont, still stands. There is abundant documentary evidence, that PANTALEONE and other members of his well known family took their name from this latter place and there is not a shred of such in the mere assertions from QUENSTEDT to JÖCHER, claiming him as a Koblenzer.

From his arts degree obtained in Pavia in 1438, (his M.D. also there in 1440), to a letter from him to the Duke of Milan Feb. 10, 1496 his career is easily followed. He is a loyal servant of the court of Savoy, highly esteemed for his medical skill and worldly sagacity by Duke LODOVICO (1440-1465) and his wife ANNE of Lusignon and Cyprus (d. 1462). The latter makes him castellan of Carignano in 1459. Through YOLANDE of France and BONA of Savoy he is in relation with the courts of France and of Milan, attending frequently to the duchess' brother LOUIS XI and from LODOVICO MORO of Milan he receives a stipend as late as 1496. In none of the documents and publications certifying these facts is there the slightest allusion to his connexion or even to an interest of his in the Rhenish town,

a curious omission in one who according to CREUTZ never did "bannish from his heart the love of his home town, calling himself with pride DE CONFLUENTIA."

His slight but interesting medical contributions were printed by incunabula presses, the *Summa lacticioniorum* at Turin 1477 by the Frenchman FABRI (my list 719. 1), the *Pillularium* (720.1) without place, date or name (Pavia 1484) probably by CARCANO with whom as also with other printers PANTALEO had close dealings, manifesting thereby his interest in the new art, and this from a very early date (1474 see GW. 5124). CREUTZ gives a very good résumé of the book on milk products, though more details are found in MALACARNE cited by WICKERSHEIMER. A. C. K.

XVIth century (whole and first half)

B. *Physical sciences and technology*

Birkenmajer, Ludwig (1855-1929). NICOLAUS COPERNICUS und der deutsche Ritterorden. 39 p. Krakau, 1937. ISIS

Diergart, Paul ; Zinner, Ernst. Wie soll die deutsche Schreibweise von "COPPERNICUS" sein? *Sudhoffs Archiv für Geschichte der Medizin* 30, 174-76, 1937. ISIS

Rosen, Edward. The *Commentariolus* of COPERNICUS. *Osiris* 3. 123-41, 1937. ISIS

"Some years before COPERNICUS consented to the publication of his large work *De revolutionibus orbium caelestium*, he wrote a brief sketch *(Commentariolus)* of his astronomical system. The *Commentariolus* was not printed; a number of handwritten copies circulated for a time among students of the science, and then disappeared from view for three centuries. A copy found in Vienna was published by MAXIMILIAN CURTZE in 1878; this Vienna MS will be referred to as V. A second copy found in Stockholm was published in 1881; this will be referred to as S. On CURTZE's collation of these two MSS LEOPOLD PROWE based the text from which the present translation was made. It has been necessary to depart from PROWE's text in a few instances; these have been indicated in the notes. A third MS is believed to exist in Leningrad; so far as I know, it has never been published."

C. — *Natural sciences*

Coutinho, Gago. GASPAR CORTE REAL e a pedra de Dighton. Breves comentarios. *Petrus Nonius* 1, 80-2, 1937. ISIS

Hillelson, S. DAVID REUBENI's route in Africa. *Jewish quarterly review* 28, 289-91, 1938. ISIS

Kimble, George H. T. The " Esmeraldo de Situ Orbis " an early Portuguese textbook on cosmography and navigation by DUARTZ PACHECO. *Osiris* 3, 88-102, 1937. ISIS

" If we exclude some rather crude rutters of uncertain date by G. PIRES and J. RODRIGUES, then the earliest dated Portuguese ' roteiro ' is the ' Esmeraldo de Situ Orbis ' of DUARTE PACHECO. From internal evidence this work can be fairly certainly ascribed to the first decade of the century, c. 1505-1508. Its author was certainly well qualified for the task, for he was an explorer as well as a man of some learning, having been down the West African coast more than once and having accompanied CABRAL on his famous expedition of 1500. The task, moreover, was not self-assumed but undertaken at the express order of King MANUEL I—a tribute, we may take it, to PACHECO's qualifications and an indication, too, of the newness of the project."

Philip, I. G. Early maps. *Antiquity* 11, 486-89, 2 pl. 1937. ISIS

" The earliest separate printed map of Great Britain has been held to be that of PIETRO COPPO, whose maps, printed from woodblocks, were discovered by Professor ALMAGIA at Pirano in Istria, and were described by him in *Geographical Journal* May 1927, 69, 441. But the maps illustrated in this number, may be as old as, if not older than, those of PIETRO COPPO, to whose work Professor ALMAGIA assigned the probable date of c. 1525. These illustrations are taken from Ashmole 1352 in the Bodleian Library, Oxford, and thanks are due to the Keeper of Western mss. for permission to reproduce the maps."

Rousseau, Jacques. La botanique canadienne à l'époque de JACQUES CARTIER. *Annales de l'ACFAS* 3, 151-236, 1937. ISIS

" Les récits des premiers explorateurs du Canada ne renferment pas de véritables études botaniques; mais il s'y trouve des listes de plantes et des observations sur la végétation du pays. Ces notes n'ont pas contribué beaucoup à l'avancement de la phytogéographie, mais elles renferment en germe la substance du folklore botanique canadien, qui date presque entièrement du régime français. C'est sous cet aspect que sont envisagées ici les vieilles relations." Ce beau mémoire est divisé comme suit : 1. JACQUES CARTIER, botaniste; 2. Les textes botaniques de CARTIER; 3. Les contemporains de CARTIER, Le sieur de ROBERVAL, JEAN ALFONSE, ANDRÉ THÉVET, JACQUES NOËL, Le voyage de HORE, Lettre à l'ambassadeur portugais en France, 1541, Interrogatoire de marins relativement à CARTIER, Lettre de LAGARTO à JEAN III; 4. Les précurseurs de CARTIER, Les Norsemen au Vinland, JEAN CABOT, GASPAR CORTE-REAL, JEAN VERRAZZANO, ESTEVAN GOMEZ, La colonie portugaise de Terre-Neuve, 1520-25, La chronique d'EUSÈBE; 5. La cartographie ancienne; 6. Liste annotée des plantes citées; 7. Bibliographie; 8. Index alphabétique des plantes.

Vasconcelos, Frazão de. Um documento inédito que importa à história da Marinharia dos descobrimentos. Ao Prof. Dr. João

MARTINS DA SILVA MARQUES. *Petrus Nonius* 1, 107-12, 1937. ISIS

D. — *Medical sciences*

Diepgen, Paul. PARACELSUS und unsere Zeit. *Fortschritte der Medizin* 55, 4 p., juli 1937. ISIS

Escribano García, Víctor. La cirugía y los cirujanos españoles del siglo XVI. (Continuación). *Boletin de la Universidad de Granada* 9, 233-60, 1937. ISIS

James, R. R. The earliest list of surgeons to be licensed by the bishop of London under the act of 3, HENRY VIII, c. II. *Janus* 41, 255-60, 1937. ISIS

Schierbeek, A. PARACELSUS. *Biologisch jaarboek uitgegeven door het koninklijk natuurwetenschappelijk genootschap Dodonaea te Gent* 4, 138-70, Antwerp, 1937. ISIS

General account and defense of PARACELSUS' philosophy, medicine and chemistry. G. S.

Schmid, Günther. Ein bisher unbekanntes Bildnis von P. A. MATTIOLI (1500-1577). *Sudhoffs Archiv für Geschichte der Medizin* 30, 133-51, 4 fig., 1937. ISIS

Simpson, Lesley Byrd. The medicine of the conquistadores : an American pharmacopoea of 1536. *Osiris* 3, 142-64, 1937. ISIS

" While exploring in the archives of Guatemala two years ago I ran across the two apothecary's price lists that form the body of this paper. They are written on regular Spanish legal foolscap, nine by twelve inches, badly faded, worm-eaten, and waterstained. Their authenticity is unquestionable. They are bound in a volume of MSS of the first half of the sixteenth century labelled *Varios curiosos papeles*. the second list bears the date, 1536; and they are written in the fearful and inimitable script of the time."

Speter, Max. Doktoranden- und Lizentiaten-Zucker-Ablieferungs-vorschrift für Mediziner anno 1524. *Centralblatt für Zuckerindustrie* Nr. 52, p. 1094-95, 1937. ISIS

E. — *Alia*

Sarton, George. Second preface to Volume XXVII. Communion with ERASMUS. *Isis* 27, 416-29, 4 fig., 1937. ISIS

XVIth century (second half)

B. — *Physical sciences and technology*

McColley, Grant. NICOLAS REYMERS and the fourth system of the world. *Popular astronomy* 46, 7 p., 1 fig., 1938. ISIS

" For a number of decades there has existed a noticeable tendency to regard the important era from 1575 to 1700 as one wherein two astronomical systems, the Ptolemaic and the Copernican, stood as rivals before Europe. Few presumably accurate generalizations could be more misleading. Throughout the period the chief rival of the Copernican theory was not the Ptolemaic, but rather a third hypothesis, the Tychonic. As J. L. E. DREYER succinctly observed, ' about the year 1630, nobody, whose opinion was worth anything, preferred the Ptolemaic to the Tychonic system.' Indeed, so far as continental Europe was concerned, the geoheliocentric hypothesis, whether Tychonic or modified Tychonic, was known and employed more widely than the Copernican." " In a fragmentary form, this system of the world had appeared as early as HERACLIDES OF PONTUS, who believed not only in the diurnal rotation of the earth, but that Mercury and Venus revolved about the sun. In the fourteenth century of our era, the first of these two important ear-marks of the hypothesis was advocated by NICOLAS ORESME, and the second accepted by him as ' reasonable.' By 1586 the theory was formulated as an astronomical system by NICOLAS REYMERS, and during this year was set up in model form for the Landgrave at Cassel. Two years later REYMERS presented it in detail in his *Fvndamentvm astronomicvm*, and a fourth system of the world entered the arena."

Wentink, L. JOANNES BAPTISTA PORTA als Physiognomonicus. *Bijdragen tot de geschiedenis der geneeskunde* 17, 203-19, 10 fig., 1937. ISIS

C. — *Natural sciences*

Fussell, G. E. Missing Tudor books on farming. *London Times literary supplement*, October 23, 1937, p. 788. ISIS

North, F. J. HUMPHREY LHUYD's maps of England and of Wales. 59 p., 12 fig. (Amgueddea genedlaethol cymbru National Museum of Wales). Cardiff, Published by the National museum of Wales and by the press board of the University of Wales, 1937 (1 s.). ISIS

" HUMPHREY LHUYD's (1527-68) maps of Wales and of England and Wales are deserving of special attention, not only on account of their early appearance (1573), but also because there are interesting problems concerning their origin and their relation to contemporary maps of the British Isles. In this monograph F. J. NORTH, the keeper of the department of geology in

the Museum, gives an outline of the history of the maps—one of which (Wales) was reprinted at intervals for nearly one hundred and seventy years—and discusses the place which they occupy in sixteenth century cartography. Like the general outline of the history of the map of Wales, issued as a museum publication in 1935 under the title ' The map of Wales (before 1600 A.D.),' this treatise was first published in *Archaeologia Cambrensis* (vol. 92, 1937) and has been reprinted by kind permission of the editors of that journal."

D. — *Medical sciences*

Doe, Janet. A bibliography of the works of AMBROISE PARÉ : Premier chirurgien et conseiller du roy. XX+266 p., 22 pls., port. University of Chicago Press, 1937, ($5.00). ISIS

This is an excellent bibliography, prepared with skill and completeness of detailed information as to typography, paginations, contents, and errata with precise collations and notes on typographical modifications. Each title is followed by the name of the bibliographer, biographical and historical notes on the book, and its relation to other editions and works of PARÉ. The location of copies of each work examined by the author and the copies contained in public and private libraries throughout the world are listed. The author discusses PARÉ's religion and concludes from the fact that all of his publishers had Huguenot connections that PARÉ himself had Protestant sympathies. The appendices contain a key to owners of PARÉ's books, a chronological list of his works, and catalogue of authors consulted. The illustrations include reproductions of the main title pages. Admirers of this great surgeon's achievements are under a heavy obligation to Miss DOE for her devoted and scholarly work and to the University of Chicago Press for the typographical skill with which the bibliographical citations are printed. C. A. K.

Izquierdo, J. J. A new and more correct version of the views of SERVETUS on the circulation of the blood. *Bulletin of the institute of the history of medicine* 5, 914-32, 5 fig., 1937. ISIS

" As the result of strong religious or nationalistic feelings; of not paying due attention to the writings by the ancients as a basis for comparison; or of indulging in accepting writings of the past as expressing modern ideas, SERVETUS' opinions on the movement of the blood have been repeatedly misunderstood, distorted or overestimated. The author has therefore sought to discover which were really the views expressed by SERVETUS and which were not, though often assigned to him, and what were the grounds and methods he used to reach his opinions." " On the whole, SERVETUS' work appears rather as a product of imagination and fantasy, than as a conquest by scientific methods which were introduced a century later by HARVEY."

XVIIth century (whole and first half)

A. — *Mathematics*

Adam, Ch. DESCARTES. Sa vie et son œuvre. 178 p. Paris, BOIVIN, 1937 (12 fr.). ISIS

Ce charmant et savant petit volume est une réduction, mise à jour, de la vaste étude qui remplissait le tome XII (1910) de la grande édition ADAM-TANNERY.

Aldrich, Virgil C. DESCARTES' method of doubt. *Philosophy of science* 4, 395-411, 1937. ISIS

Bouglé, Célestin. Sous le signe de DESCARTES. *Revue de Paris* 44, 368-86, 1937. ISIS

Descartes. Bibliothèque nationale. DESCARTES, Exposition organisée pour le III[e] centenaire du *Discours de la méthode*. XVIII+172 p., 7 pl. Paris 1937 (18 fr.). ISIS

Contents : 1. La vie; 2. Portraits de DESCARTES; 3. L'honnête homme; 4. L'œuvre; 5. Le cartésianisme de 1650 à 1715; 6. Œuvres d'art; 7. Instruments de mathématiques.

(Descartes). Congrès DESCARTES (Paris, 1937). Études cartésiennes. Actualités scientifiques et industrielles, nos. 530, 531, 532. 180+130+146 p. Paris, HERMANN, 1937 (56 fr.).

L'unité de la science. Actualités scientifiques et industrielles, nos 533, 534. 222+176 p. Paris, HERMANN, 1937 (45 fr.).

Logique et mathématiques. Actualités scientifiques et industrielles, no. 535. 226 p. Paris, HERMANN, 1937 (25 fr.).

Causalité et déterminisme. Actualités scientifiques et industrielles, no. 536. 172 p. Paris, HERMANN, 1937 (20 fr.).

Analyse réflexive et transcendante. Actualités scientifiques et industrielles, nos. 537, 538. 240+182 p. Paris, HERMANN, 1937 (50 fr.).

La valeur : les normes et la réalité. Actualités scientifiques et industrielles, nos. 539, 540, 541. 192+142+130 p. Paris, HERMANN, 1937 (61 fr.). ISIS

(Descartes). Le glaneur châtelleraudais, 4[e] année, mai 1937. Numéro spécial consacré au tricentenaire du *Discours de la méthode*. ISIS

Articles consacrés aux origines de DESCARTES, à ses pérégrinations posthumes, aux fêtes de mai 1937 à Châtellerault, et à la Société cartésienne de cette ville.

(Descartes). Hommage à DESCARTES. *Les nouvelles littéraires*, 771, 24 juillet, 1937. ISIS

(Descartes). Le lieu de naissance de DESCARTES. Articles par LOUIS DE GRANDMAISON et J. RONDEAU. *L'illustration* 95, 531-32, 1937. ISIS

(Descartes). *Revue de littérature comparée* 17, juillet-septembre 1937. ISIS

Les 4 articles de fond de ce fascicule sont consacrés à DESCARTES. Ils ont pour auteurs CH. ADAM, L. COHEN ROSENFIELD, A. O. VÉRTES et H. L. BRUGMANS.

(Descartes). *Revue de synthèse*, 14, numéro spécial consacré à DESCARTES, avril 1937. ISIS

(Descartes). *Revue philosophique*, 62, numéro spécial consacré à DESCARTES, mai-août, 1937. ISIS

(Descartes). Universidad de Buenos Aires. Facultad de filosofia y letras, Instituto de filosofia. DESCARTES. Homenaje en el tercer centenario del " Discurso del metodo." 3 tomes, octobre-novembre-décembre, 1937. ISIS

Langer, R. E. RENÉ DESCARTES. *American mathematical monthly* 44, 495-512, 1937. ISIS

Rivaud, Albert. DESCARTES. *Mercure de France*. 277, 5-29, 1937. ISIS

Valéry, P. DESCARTES. *Rev. de mét. et de mor.* 44, 693-710, 1937. ISIS

Discours prononcé à la Sorbonne pour l'inauguration du IX[e] Congrès international de philosophie, le 31 juillet 1937.

B. — *Physical sciences and technology*

Bentham, Muriel A. Some seventeenth century views concerning the nature of heat and cold. *Annals of science* 2, 431-50, 1937. ISIS

Koyré, A. GALILÉE et l'expérience de Pise. A propos d'une légende. *Annales de l'Université de Paris* 12, 441-53, 1937. ISIS

L'auteur prouve que GALILÉE n'a pas fait l'expérience de Pise et ne l'a même pas imaginée. Il est remarquable qu'il ne cite point l'ouvrage de LANE COOPER : *Aristotle, Galileo, and the tower of Pisa* (Cornell University Press, 1935; *Isis* 24, 218) où la même question a été discutée très longuement, tous les textes cités, et la même conclusion atteinte. G. S.

Stolzius von Stolzenberg, Daniel. The little mystic-magic picture book for the industriously practicing Abecedarian of the fraternity of the Rose Cross. Translated from the German by NICHOLAUS. 231 p. (left-hand pages blank). Chicago, Aries Press, 1937 ($7.50).

An English translation, with mediocre reproductions of the 107 copperplate pictures, of the *Chymisches Lustgärtlein*, Frankfort, 1624.

DANIEL STOLZIUS CUTTENUS (VON KUTTENBERG) took his bachelor's degree at the University of Prague in 1618, and the Master's degree in 1619, both of them with theses on astrological subjects. In 1621 he appeared on the matriculation roll of the University of Marburg under the name of M. DANIEL STOLCIUS CUTTENBERGENUS. The dedication of the *Viridarium Chymicum* is dated Oxford, 1623, but the author does not appear to have been admitted to the university. The Latin *Viridarium chymicum* was published at Frankfort in 1624 by LUCAS JENNIS who also published the German translation, *Chymisches Lustgärtlein*, later in the same year. The work is a picture book containing 107 copperplate engravings, alchemical pictures which JENNIS had published in earlier books, each picture accompanied in the *Viridarium* by a Latin verse by STOLZIUS, in the *Chymisches Lustgärtlein* by a German translation of the Latin by DANIEL MEISSNER VON COMMONTHAW, B. P. L. C. The present book purports to be a complete translation of the German edition, but it lacks the dedication which JOHN READ (" Prelude to chemistry", New York, 1937, p. 256-57) reports for the *Viridarium*. T. L. D.

C. — *Natural sciences*

Wein, Kurt. CASPAR BAUHIN an LUDWIG JUNGERMANN. Ein Beitrag zur Geschichte der Botanik des 17. Jahrhunderts. *Sudhoffs Archiv für Geschichte der Medizin* 30, 152-66, 1937. ISIS

D. — *Medical sciences*

Artelt, Walter. Deutsche und Niederländer als Pioniere der Tropenmedizin im 17. Jahrhundert. *Klinische Wochenschrift* 17, 10 p., 6 fig., 1938. ISIS

Silvette, Herbert. On insanity in seventeenth-century England. *Bulletin of the institute of the history of medicine* 6, 22-33, 1938. ISIS

E. — *Alia*

McColley, Grant. The date of GODWIN's *Domingo Gonsales*. *Modern philology* 35, 47-60, 1937. ISIS

Apropos of FRANCIS GODWIN (1562-1633), bishop of Llandaff and Hereford. "The Domingo Gonsales, definitely written after 1615, was probably composed during 1627-28."

XVIIth century (second half)

A. — *Mathematics*

Fueter, Eduard. ISAAK NEWTON und die schweizerischen Naturforscher seiner Zeit. Beiblatt zur *Viertaljahrsschrift der Naturforschenden Gesellschaft in Zürich* 82, 32 p., 1937. ISIS

Seki, Takakazu (1642-1708). Seki-ryû sanpô shichibu sho (Seven mathematical treatises) edited by the members of the Physico-mathematical society of Japan. 28+178 p., 2 pl. Tokyo, Sanshu sha, 1907. ISIS

Reviewed by SHIO SAKANISHI, *Isis* 27, 507, 1937.

B. — *Physical sciences and technology*

Diergart, Paul. Über die Danziger Brauereien der Familie HEWELKE und über den grossen Himmelsforscher HEVELIUS als Brauer und Deutscher. *Wöchentl. Beil. der Tagesztg. für Brauerei* 35, 263-64, 1937. ISIS

Reviewed by DIERGART, *Mitt. z. Gesch. d. Med., d. Naturw., u. d. Tech.* 37, 116, 1938.

Lysaght, D. J. HOOKE's theory of combustion. *Ambix* 1, 93-108, 2 fig., 1937. ISIS

McColley, Grant. MILTON's Dialogue on astronomy : the principal immediate sources. *Publications of the modern language association of America* 52, 728-62, 1937. ISIS

"In a recent series of studies I developed at some length the general background of cosmological thought which gave rise to and in large measure explains both the astronomy and the astronomical comment of *Paradise Lost*. The present essay continues this investigation of MILTON's cosmological beliefs, but restricts discussion to the Raphael-Adam dialogue of Book VIII, interpreted in the light of its immediate sources. In brief, these sources consist of a number of related passages from three English books contemporary with MILTON."

C. — *Natural sciences*

Cole, F. J. The birthplace of JAN SWAMMERDAM, 1637-1680. *Isis* 27, 452, 1 pl., 1937. ISIS

Meyer, A. W. LEEUWENHOEK as experimental biologist. *Osiris* 3, 103-22, 1937. ISIS

D. — *Medical sciences*

Broekaert, Arthur. JAN PALFJIN. Een levensbeeld, 1650-1730. 266 p. Cultura. Brugge, CAYMAN-SEYNAVE, 1936. ISIS

D'Esaguy, Augusto. The dramatic life of ORÓBIO DE CASTRO. *Bulletin of the institute of the history of medicine* 5, 822-26, 2 fig., 1937. ISIS

Lincke, Joachim. Der Chirurg LAURENT VERDUC der Ältere und sein Werk. 50 p. (Aus dem Institut für Geschichte der Medizin an der Universität Leipzig). 1937. ISIS

Miller, Genevieve. Unpublished autographs in the Welch medical library. 3. An autograph of JOHANNES TACKIUS (1617-1675). *Bulletin of the institute of the history of medicine* 5, 933-36, 1 fig., 1937. ISIS

Napjus, J. W. De geneeskundige hoogleeraren aan de franeker hoogeschool en het Athenaeum (1585-1843) VIII. PHILIPPUS MATTHAEUS Senior. *Bijdragen tot de geschiedenis der geneeskunde* 17, 169-76, 1 pl., 1937. ISIS

Owen, Gilbert Roy. The famous case of Lady ANNE CONWAY. *Annals of medical history* 9, 567-71, 1937. ISIS

Whitney, George C. A note on the definition of GLISSON's capsule. *Anatomical record* 68, 383-87, 1937. ISIS

E. — *Alia*

Bachelard, Gaston. Un livre d'un nommé R. DESCARTES. *Archeion* 19, 161-71, 1937. ISIS

A propos d'un livre publié à Paris en 1667 " Les véritables connaissances des influences célestes et sublunaires. Avec la décision de quantités de belles questions tant astrologique, que astronomique, ensuite la démonstration de la vertu des astres, et des planètes, du signe des douze maisons. Le tout

mis en ordre et en III parties, contenant IX chapitres, avec figures. Enfin, l'auteur indiqué est M. R. DESCARTES."

Keyser, Cassius Jackson. BENEDICT SPINOZA. *Scripta mathematica* 5, 33-6, port., 1938. ISIS

(Molière). The flying physician, translated from the French of JEAN-BAPTISTE POQUELIN DE MOLIÈRE, in imitation of HENRY BAKER, with introduction and notes, by HERBERT SILVETTE. *Medical life* 44, 342-64, 1937. ISIS

XVIIIth century (whole and first half)

A. — *Mathematics*

Speiser, Andreas. Report of the Euler commission. *National mathematics magazine* 12, 122-24, port., 1937. ISIS

B. — *Physical sciences and technology*

Dyment, S. A. Some eighteenth century ideas concerning aqueous vapour and evaporation. *Annals of science* 2, 465-73, 1937. ISIS

Menshutkin, B. N. A biography of MIKHAILO VASILYEVICH LOMONOSOV. Acad. of Sciences of the USSR, popular science series. 240 p., 63 figs., 3 pl., frontisp. Moscow and Leningrad, Acad. of Sc. of the USSR, 1937. (In Russian.) (6 rbls.; binding, 1.50 rbls.). ISIS

MENSHUTKIN prepared, in 1911, at the request of the Academy of Sciences, a biography of LOMONOSOV (1711-1765), for the bicentennial celebration. This biography remained unpublished until 1925, when a book of 104 pages, with a frontispiece but without illustrations, appeared, under the title " M. V. LOMONOSOV," in the Biographical Library, a series of popularly priced biographies published in Moscow and Leningrad (Gosudarstvennoye Izdatelstvo). The present volume, prepared for the 225th anniversary of LOMONOSOV's birth, ought to be considered as a second, enlarged and illustrated, edition of the book published in 1925; it is true that the very existence of the 1925 edition is not mentioned in it, and that the Preface describes it as a " rewritten and enlarged " version of a biography written in 1911; it is equally true that the edition of 1925 makes no references to the manuscript of 1911; a collation of the editions of 1925 and of 1937 makes it clear, however, that we have before us a 2nd edition of a book first published in 1925, not an editio princeps of a manuscript of 1911. The life and work of LOMONOSOV are presented in a very readable fashion, and the numerous illustrations help the reader to visualize the contemporary scene. It is to be regretted that this book—the standard popular biography

of LOMONOSOV for many years to come—is printed on cheap paper and that some of the illustrations have thus lost much of their value.

A. P.

D. — *Medical sciences*

Beekman, Fenwick. The rise of British surgery in the eighteenth century. *Annals of medical history* 9, 549-66, 5 fig., 1937. ISIS

Friedman, Reuben. RICHARD MEAD : his contribution to scabies. *British journal of dermatology and syphilis* 49, 527-50, 1937. ISIS

This paper includes a facsimile of MEAD's paper in the *Philosophical transactions* for Jan. and Feb. 1703.

G. S.

Overhoff, Wilhelm. JOHN DOUGLAS, Chirurg und Lithotomist. Ein Beitrag zur Geschichte der Steinoperation. 63 p. Institut für Geschichte der Medizin an der Universität Leipzig, 1937. ISIS

Packard, Francis R. WILLIAM CHESELDEN (1688-1752). Some of his contemporaries, and their American pupils. *Annals of medical history* 9, 533-48, 6 fig., 1937. ISIS

Shorr, Philip. Sir JOHN FREIND (1675-1728) M.D., a pioneer historian of medicine. *Isis* 27, 453-74, 6 fig., 1937. ISIS

E. — *Alia*

Ager, J. C. EMANUEL SWEDENBORG. 64 p. Boston, Swedenborgian Book Store (no date, received Jan. 1938). ISIS

Delorme, Suzanne. La vie scientifique à l'époque de FONTENELLE d'après les éloges des savants. *Archeion* 19, 217-35, 1937. ISIS

Hazard, Paul. VOLTAIRE et LEIBNIZ. *Acad. r. de Belgique, Bull. de la cl. des lettres*, 23, 435-449, 1937. ISIS

Nicolson, Marjorie ; Mohler, Nora M. SWIFT's " Flying island " in the *Voyage to Laputa*. *Annals of science* 2, 405-30, 1 pl., 1937. ISIS

XVIIIth century (second half)

A. — *Mathematics*

Jelitai, Józef. Leben und Werke des ungarischen Mathematikers LADISLAUS CHERNAC (1740-1816). *Debreceni Szemle*, H. 7-8, 8 p., 1 pl., Budapest, 1937 (in Hungarian with German symmary). ISIS

B. — *Physical sciences and technology*

(Galvani, Luigi). Bicentenary of the birth of GALVANI. Celebration at Bologna. *Nature* 140, 836-38, 1937. ISIS

Getman, Frederick H. Sir CHARLES BLAGDEN, F. R. S. *Osiris* 3, 69-87, 1937. ISIS

Speter, Max. Bibliographie von Zeitschriften-, Zeitungs-, Bücher-, Broschüren- u. dgl. Veröffentlichungen FRANZ CARL ACHARDS. *Die Deutsche Zuckerindustrie* 6, Nr. 1, 69-74, 1938. ISIS

Speter, Max. Eine Marggrat-Schaumünze von 1779. *Die Deutsche Zuckerindustrie* Nr. 48, p. 1061, 1937. ISIS

Wilson, Forsyth J. The chemical society of Glasgow : minute book of 1800-1801. *Annals of science* 2, 451-59, 1937. ISIS

C. — *Natural sciences*

Brown, Ralph H. The De Brahm charts of the Atlantic Ocean, 1772-1776. *Geographical review* 28, 124-32, 4 fig., 1938. ISIS

Peola, Paolo. Intuizioni di ALESSANDRO TONSO (1761-1820) sulla geologia della bassa valle padana. *Archeion* 19, 152-60, 1937. ISIS

True, Rodney H. FRANÇOIS ANDRÉ MICHAUX, the botanist and explorer. *Proceedings of the American philosophical society* 78, 313-27, 1937. ISIS

" This paper sketches in outline the chief events in the life of ANDRÉ MICHAUX and that of his son, the subject of the sketch. The two are considered because their work was so very thoroughly intertwined. The chief botanical explorations of FRANÇOIS ANDRÉ MICHAUX are outlined, and something of the botanical accomplishment of both the father and the son stated. The relation of the son to the American philosophical society is pointed out, and the story of the MICHAUX memorial grove in Fairmount Park has been brought up to date."

D. — *Medical sciences*

Hart, Andrew DeJarnette, jr. THOMAS JEFFERSON's influence on the foundation of medical instruction at the University of Virginia. *Annals of medical history* 10, 47-60, 3 fig., 1938. ISIS

Jorge, Ricardo. " Receituário brasilico." A proposito do artigo " sôbre os Jesuítas no Brasil e a medicina." *Petrus Nonius* 1, 13-18, 1937. ISIS

Apropos of two collections of recipes dated Rome 1762, 1766. G. S.

Knyveton, John. The diary of a surgeon in the year 1751-1752. Edited by ERNEST GRAY. New York, Appleton-Century, 1937. ISIS

Reviewed by RANDOLPH BARTON, *Natural history*, p. 153, February 1938.

Meyer, A. W. The HUNTERS in embryology. *California and western medicine* 45, nos. 5-6, 1936; 46, no. 1, 1937. 23 p., 3 fig. ISIS

" The famous Scotchmen, JOHN and WILLIAM HUNTER, have always occupied a prominent place in the history of medicine, and deservedly so. WILLIAM also has usually been given a place in the history of embryology almost wholly denied JOHN."

Monteiro, Arlindo Camilo. Les doctrines médicales de WILLIAM CULLEN et JOHN BROWN en Portugal et en Espagne. *Petrus Nonius* 1, 83-106, 1937 (to be continued). ISIS

Van Andel, M. A. Febris Nautica. *Bijdragen tot de geschiedenis der geneeskunde* 17, 180-89, 1937. ISIS

E. — *Alia*

Bessmertny-Heimann, Bertha. L'histoire des sciences dans l'encyclopédie. *Archeion* 19, 196-203, 1937. ISIS

Clarke, M. L. RICHARD PORSON, (1759-1808). VIII+132 p. Cambridge University Press, 1937 ($1.90). ISIS

Mr. CLARKE's sketch of RICHARD PORSON's life may perhaps serve to remind some that there once was such a person. Perhaps the greatest Greek textual critic and scholar of his time, PORSON added to that distinction the possession of a noble character, a memorable wit, and a thirst for spiritous liquors of infinite capacity. In 1861, the Rev. JOHN SELBY WATSON published a compendious account of PORSON, *The life of Richard Porson* (London,

LONGMANS, 1861, p. XVI+431). Mr. CLARKE considers this an "undistinguished compilation." That may be, but WATSON's book is vastly more informative and a very great deal more entertaining than Mr. CLARKE's. Mr. CLARKE's ascetism has prevented him from mentioning much that was worth mentioning even in "*a biographical essay*." This is a pity, but there are limits to the length of an essay, and within the bounds of the amount of space which Mr. CLARKE has permitted himself he has given a very excellent account of PORSON and his work and influence. The photographic reproduction of HOPPNER's portrait of PORSON is a great improvement on ADLARD's engraving of the same portrait prefixed to WATSON's work. There are ten hitherto unpublished letters from PORSON's hand included in the present volume, and his meticulous Greek and English script is reproduced in a number of plates. It is interesting to note that the Greek type adopted by the Cambridge Press is based on PORSON's Greek script. Mr. CLARKE's volume, it is to be hoped, will revive interest in a very great scholar and a very great man. M. F. A.-M.

Sarton, George. ANQUETIL-DUPERRON (1731-1805). *Osiris* 3, 193-223, 11 fig., 1937. ISIS

Biography and bibliography of the founder of Iranian and Hindu studies, one of the heros of learning. G. S.

XIXth century (whole and first half)

A. — *Mathematics*

Birkhoff, Garrett. GALOIS and group theory. *Osiris* 3, 260-68, 1937. ISIS

Sarton, George. EVARISTE GALOIS. *Osiris* 3, 241-59, 1937. ISIS

"The following biography of GALOIS was originally published in the *Scientific monthly*, October 1921, 363-75. A relatively large number of reprints were published at the same time, which I distributed, according to my custom, to the Harvard and Radcliffe students attending my courses on the history of mathematics. That supply being exhausted it occurred to me that it would be worthwhile to reprint the article in *Osiris*. The text is the same as in the first edition except for minor corrections, but there has been added to it : 1) a study on GALOIS and group theory by GARRET BIRKHOFF (Harvard University). 2) A short bibliography by myself. 3) GALOIS' portrait and an autograph, both derived from PAUL DUPUY's fundamental memoir of 1896."

B. — *Physical sciences and technology*

Almeida e Vasconcelos, Fernando de. Uma prioridade da ciência matemática portuguesa—DANIEL AUGUSTO DA SILVA (1814-1878) e à constituição da astática. *Petrus Nonius* 1, 145-64, 1937. ISIS

Ampère, André-Marie (1775-1836). Sur la rectification d'un arc quelconque de cercle plus petit que la demi-circonférence par ANDRÉ-MARIE AMPÈRE, âgé de treize ans (8 juillet 1788). Texte inédit, publié et commenté par LOUIS DE LAUNAY, CLÉMENT LIMB et CLAUDIUS ROUX. *Comptes rendus, de l'Académie des sciences* 2032, 1194-97, 1936. ISIS

Bowen, H. G. 100 years of steam in the United States navy. 32 p. Newcomen Society, American Branch, 1937. ISIS

Emanuelli, Pio. GIACOMO LEOPARDI storico dell'astronomia. *Archeion* 19, 236-39, 1 fig., 1937. ISIS

Larmor, Joseph. FARADAY on electromagnetic propagation. *Nature* 141, 36, 1938. ISIS

Lippmann, Edmund O. von. Vor hundert Jahren (XVII). *Die Deutsche Zuckerindustrie* 75-6, 1938? (received Feb. 1938). ISIS

Lortie, Léon. Notes sur le " cours abrégé de lecons de chymie " de JEAN-BAPTISTE MEILLEUR. *Annales de l'ACFAS* 3, 237-71, 2 facs., 1937. ISIS

" Ce fut pour un grand nombre une véritable révélation d'apprendre, il y a quelques années, que JEAN-BAPTISTE MEILLEUR, mieux connu comme premier surintendant de l'instruction publique de Bas-Canada, était l'auteur d'un ' Cours élémentaire de leçons de chymie, ' publié en 1833, l'année même où avec CAZENEUVE et l'abbé LABELLE il fondait le collège de l'Assomption. On trouve cet ouvrage dans toutes nos bibliothèques publiques et dans celles d'un bon nombre de collèges. J'eus bientôt l'occasion de l'étudier et de me familiariser un peu avec la vie de celui que l'on continue d'appeler le docteur MEILLEUR."

Norman, Daniel. JOHN WILLIAM DRAPER's contributions to astronomy. *The telescope* 5, 11-16, 3 fig., 1938. ISIS

" Astronomers almost invariably associate the name DRAPER with HENRY DRAPER (1837-1882) who initiated the photographic study of stellar spectra, but they do not seem to be aware that his father and contemporary JOHN WILLIAM DRAPER (1811-1882) played an even more important role in the development of photography and in its application to astronomical and radiometric problems of all kinds, and in the initiation of spectroscopic chemical analysis."

Schreber, Karl. SADI CARNOT und RUDOLF CLAUSIUS. Wie nennt CARNOT den später von CLAUSIUS " Entropie des umkehrbaren

Vorganges" genannten Begriff? *Sudhoffs Archiv für Geschichte der Medizin* 30, 167-73, 1 fig., 1937. ISIS

Speter, Max. Aus der Frühgeschichte des Gegenstromprinzip-Kühlers : Eine Weigelsche Brennereikühlanstalt und ein sogenannter Pfaff vom Beginn des 19. Jahrhunderts. *Zeitschrift für Spiritusindustrie* Nr. 52, p. 364-65, 4 fig., 1937. ISIS

C. — *Natural sciences*

Herbert, William (1778-1847). Herbertia volume IV, dedicated to the memory of WILLIAM HERBERT. Edited by HAMILTON P. TRAUB. Orlando, Florida, American Amaryllis Society, 1937. ISIS

"This volume of *Herbertia* is dedicated to the memory of The Hon. and Very Rev. WILLIAM HERBERT, 1778-1847, Dean of Manchester, in celebration of the 100th anniversary of the publication of his enduring work, *Amaryllidaceae*, in 1837." In addition to the usual technical papers, this volume contains a portrait of HERBERT, a 17 page biography of HERBERT by ARTHINGTON WORSLEY and a paper *The early hybridizers and the origin of genetics* by C. D. DARLINGTON. The famous chapter "On crosses and hybrid intermixtures in vegetables" is reprinted from the *Amaryllidaceae*. In this chapter HERBERT described his interesting experiments in hybridization and showed himself to be a pre-Darwinian evolutionist. C. Z.

Purkinje, Joannes Evangelista (1787-1869). Commentatio de examine physiologico organi visus et systematis cutanei quam pro loco in gratioso medicorum ordine rite obtinendo die XXII. Decembris 1823. H. X. L. C. publice defendet. 58 p. 's-Gravenhage, JUNK, 1937 (Dutch, fl. 8). ISIS

This new JUNK facsimile (no. 28) was published on the occasion of the 150th anniversary of JAN EVANGELISTA PURKYNJE, the great Bohemian physiologist (see two studies about him in *Osiris*, vol. 2). Says Dr. JUNK : "Wenige Zweige menschlicher Geistes-Tätigkeit blieben diesem Manne fern. Seine literarische philosophische und politische Tätigkeit sei hier nur erwähnt. Aber auf seinem Hauptgebiet, dem biologischen, war er von einer erstaunlichen Fruchtbarkeit und Genialität. Er war der Begründer der modernen Histologie; er erfand die ersten Methoden der mikroskopischen Untersuchung; er war es, der als erster die Uebereinstimmung der elementaren Structur des Tier-Körpers mit der der Pflanze erkannte und so TH. SCHWANN die Grundlage für seine Zellentheorie lieferte; er beschrieb zuerst die Nervenzellen im Gehirn und Rückenmark. Die Entdeckung des pflanzlichen Zellkerns durch ROBERT BROWN basirte auf P.'s Untersuchungen. Er war ein Entdecker auf dem Gebiete der Pharmakologie, dem der Entwicklung des menschlichen Zahnes und der weiblichen Geschlechts-Organe, dem der mikroskopischen Anatomie der Epidermis und der Epithelien überhaupt

Im Endocardium entdeckte er die nach ihm genannten PURKYNJE-Zellen. Besonders wichtig sind aber die Publicationen, mit denen er seine wissenschaftliche Tätigkeit begonnen hat, nämlich die über das Auge und über Erscheinungen im subjektiven Sehfeld des Auges, die auch GŒTHE's Bewunderung erregten. So beobachtete P. als erster jene Erscheinung im Innern des Auges, welche die Grundlage der H. v. HELMHOLTZ'schen Entdeckung des Augenspiegels bildete."

PURKINJE and BOLZANO are the two greatest scientific glories of Czechoslovakia, and every praise of them is grateful to our ears. G. S.

Purkyně, Jan Evangelista (1787-69). Many writings devoted to him because of the celebration of the 150th anniversary of his birthday. See list in *Mitteilungen zur Geschichte der Medizin, der Naturwissenschaften, und der Technik* 37, 25-8, 1938. See biographies of him in *Osiris* II, 1937. ISIS

Purkyně, Jan Ev. In memoriam, 1787-1937. 100 p., port. Prague, Purkyňova Společnost, Sdružení pro studium osobnosti a díla J. E. PURKYNĚ v. Praze, 1937. ISIS

" Rerum naturae duo inquisitores celeberrimi in nostra Re publica lucem aspexerunt IOANNES EUANGELISTA PURKYNĚ et GREGORIUS MENDEL, unus Bohemus, alter Germanus, at scientiae pervestigatione uterque totius orbis terrarum civis. Cum GREGORI MENDEL qui legem naturalem hereditatis perspexit nomen apud omnes naturae admiratores cultoresque pervulgatum sit, nomen IOANNIS EUANGELISTAE PURKYNĚ ad hunc diem minus est notum. Et tamen etiam hic vir doctissimus sine dubio dignus est qui ab omnibus nominetur, quia in numero eorum est qui XIX saeculo biologiae studiis maximam operam dederunt et ad ea studia plurimum contulerunt. Hoc anno centesimo quinquagesimo postquam PURKYNĚ natus est, nova praebetur occasio memoriae eius revocandae. Quam ob rem ' Societas PURKYNĚ,' anno 1935 Pragae condita illiusque viri vitae atque operis studio dedita, hos commentarios quibus eius de variis doctrinis merita demonstrantur collegit et edidit et iis, qui his sollemnibus nec non iis qui IV Congressui internationali historicorum scientiarum ac technicae intersunt, dedicavit. Pragae, mense Septembri 1937. Societas Purkyniana."

Purkyně, Jan Ev. Sebrané spisy. Opera omnia. vol. 2, 179 p. Prague, Purkyňova Společnost, Sdružení pro studium osobnosti a díla J. E. PURKYNĚ v Praze, 1937. ISIS

Sauerbruch, Ferdinand. CARL GUSTAV CARUS zu Ehren. Worte bei der Enthüllung einer Gedenktafel am Carus-Haus zu Dresden am 20. September 1936. *Sudhoffs Archiv für Geschichte der Medizin* 30, 113-14, 1 fig., 1937. ISIS

D. — *Medical sciences*

Faucci, Ugo. In memoria di AGOSTINO BASSI (1773-1856) (Nel 1° centenario del " ... Mal del segno ") (1835-1935). *Rivista di storia delle scienze mediche* 28, 283-85, 1937 (to be cont'd). ISIS

Flaxman, Nathan. The hope of cardiology, JAMES HOPE (1801-1841). *Bulletin of the institute of the history of medicine* 6, 1-21, 1938. ISIS

Marshall, Mary Louise. Some nineteenth century fee bills. *Bulletin of the institute of the history of medicine* 6, 62-80, 4 fig., 1938. ISIS

Meyer, A. W. Was VON BAER's discovery an accident? *Bulletin of the institute of the history of medicine* 5, 33-42, 1937. ISIS

" Everyone familiar with progress in or the history of science is aware of the fact that many discoveries have been avowed accidents. Many more, no doubt, were accidents though not avowed ! Others were frankly declared to have been accidents at the time they were made and by those who made them, but this was later overlooked or forgotten, not only by others but also by the discoverer himself. This seems to have been true of KARL ERNST VON BAER and his discovery of the mammalian ovum."

Milch, Werner. Romantische Medizin. Ihre Probleme und ihr Problem. *Schweizerische Medizinischen Wochenschrift* 67, 1164, 1937. ISIS

Rucker, Pierce. Dr. JOHN PETER METTAUER (1787-1875), an early southern gynecologist. *Annals of medical history* 10, 36-46, 5 fig., 1938. ISIS

Schunke, Ilse. Der Nachlass von GOTTFRIED REINHOLD TREVIRANUS in der Staatsbibliothek Bremen. *Sudhoffs Archiv für Geschichte der Medizin* 30, 115-32, 1 fig., 1937. ISIS

E. — *Alia*

Dehérain, Henri. SILVESTRE DE SACY et l'enseignement de l'arabe à Marseille. *Journal des savants* 215-21, 1937. ISIS

Bolzau, Emma Lydia. ALMIRA HART LINCOLN PHELPS, her life and work. Philadelphia, 1936 (published by the author). ISIS

The subject of this biography was the author of *Familiar lectures on botany*

(1829) which became famous as *Mrs. Lincoln's botany*, a text book which dominated the field for the sixty years which followed its first appearance. Mrs. PHELPS also wrote *Chemistry for beginners* (1834) and *Familiar lectures on natural philosophy* (1837) but these books, while successful, did not have the influence of her botany. Mrs. PHELPS added nothing to the sciences themselves but she was a great innovator of the teaching methods which are still more or less in vogue. Chapter VII of the biography contains a detailed exposition of the early nineteenth century science texts in America, but the emphasis is entirely pedagogical. C. Z.

XIXth **century** (second half)

A. — *Mathematics*

Vilhena, Henrique de. O Professor Doutor FRANCISCO GOMES TEIXEIRA. Elogio, notas de biografia, bibliografia, documentos. 332+ IV p., 3 ills. Lisboa, 1936. ISIS

Reviewed by ARLINDO CAMILO MONTEIRO, *Petrus Nonius* 1, 192-99, 1937.

B. — *Physical sciences and technology*

Buhot, René. Un prochain cinquantenaire. Comment le cinématographe est né de la physiologie. *Revue générale des sciences* 48, 365-68, 1937. ISIS

Chauvois, Louis. D'ARSONAL (65 ans à travers la science). 430 p., ill., Paris, OLIVEN, 1937. ISIS

Chenevier, Robert. GUGLIELMO MARCONI. *L'illustration* 95, 414-16, ill., 1937. ISIS

Emerson, Haven. CHARLES FREDERICK CHANDLER, 1836-1925. New York's first public health chemist. *Science* 86, 453-61, 1937. ISIS

Lippmann, Edmund O. v. Volume III of *Osiris* dedicated to him, contains his biography by J. R. PARTINGTON, with bibliography and portrait. ISIS

Partington, J. R. EDMUND O. VON LIPPMANN. *Osiris* III, 5-21, port., 1937. ISIS

With bibliography and portrait.

Pelseneer, Jean. Catalogue sommaire des manuscrits du fonds Stas de l'Université libre de Bruxelles. *Bulletin de la société chimique de Belgique* 46, 367-76, 1937. ISIS

Rây, Prafulla Chandra. Life and experiences of a Bengali chemist. Vol. II, VIII+469 p. Calcutta, CHUCHERVERTTY, CHATTERJEE, 1935. ISIS

Reviewed by TENNEY L. DAVIS. *Isis* 27, 515-16. 1937.

Sarton, George. CHARLES FREMONT, historien de la technologie (1855-1930). *Isis* 27, 475-84, 1937. ISIS

Westinghouse, George (1846-1914). Commemoration. A forum presenting the career and achievements of GEORGE WESTINGHOUSE on the 90th anniversary of his birth, conducted by the American society of mechanical engineers, December 1, 1936. 78 p., illus. New York, American society of mechanical engineers, 1937. ISIS

A very fine " Festschrift " in remembrance of the great inventor of the air brake (first used in 1869), of many appliances for use of the alternating current, the steam turbine, for railway electrification, etc. The book is admirably illustrated. G. S.

C. — *Natural sciences*

Avery, G. S., jr. ; Burkholder, P. R. ; Creighton, H. B. ; Scheer, B. A. DARWIN and early discoveries in connection with plant hormones. *Science* 87, 1938. ISIS

Cholodny, N. CHARLES DARWIN and the modern theory of tropisms. *Science* 86, 468, 1937. ISIS

" This note leaves no doubt that DARWIN considers the transmission of the phototropic stimulus in coleoptile tissues as the movement of a certain substance secreted by the phototropically sensitive tip of this organ."

Hobbs, William H. Discovery and exploration within the area to the west of the Kane basin. *Bulletin of the geographical society of Philadelphia* 35, 26-30, 2 fig., 1937. ISIS

Hobbs, William Herbert. JOHN WESLEY POWELL, 1834-1902. *Scientific monthly* 39, 519-29, 1934. ISIS

Hobbs, William Herbert. PEARY. 502 p. New York, MACMILLAN, 1936. ISIS

Reviewed by ERWIN RAISZ, *Isis* 27, 508-12, 1937.

Roback, A. A. Fifty years of the dissociation school. *Journal of abnormal and social psychology* 31, 131-37, 1936. ISIS

D. — *Medical sciences*

Abbott, Maude E. " More about OSLER." *Bulletin of the institute of the history of medicine* 5, 765-96, 8 fig., 1937. ISIS

Diepgen, Paul. RUDOLF VIRCHOW, 1821-1902. Die grossen Deutschen, *Neue Deutsche Biographie*, p. 368-75, 2 port., 1937? (received 1938). ISIS

Dock, George. Reminiscences of Dr. WILLIAM OSLER at Blockley Hospital and working on the text-book. *Bulletin of the institute of the history of medicine* 5, 797-99, 1937. ISIS

Gruber, Georg B. Dr. ERNST MÜNCHMEYER und die " Münchmeyersche Krankheit " (" Myositis ossificans progressiva " (v. Dusch). *Mitteilungen zur Geschichte der Medizin, der Naturwissenschaften und der Technik* 37, 1-6, 1938. ISIS

Hutcheson, J. Morrison. GEORGE BEN JOHNSTON, M. D. LL. D. (1853-1916). *Annals of medical history* 10, 15-22, 4 fig., 1938. ISIS

Kagan, Solomon R. JACOB DA SILVA SOLIS-COHEN (1838-1927). *Medical life* 44, 291-313, port., 1937. ISIS

Biography of the founder of laryngology in the U. S. A. with portrait and bibliography. G. S.

Macht, David I.; Gessford, Nellie L. The unfortunate drug experiences of DANTE GABRIEL ROSSETTI. *Bulletin of the institute of the history of medicine* 6, 34-61, 1938. ISIS

White, William. Re-echoes of Sir WILLIAM OSLER's " the fixed period." *Bulletin of the institute of the history of medicine* 5, 937-40, 1937. ISIS

E. — *Alia*

Baym, Max I. WILLIAM JAMES and HENRY ADAMS. *New England quarterly* 10, 717-42, 1937. ISIS

Gómez de Orozco, Federico. Doña ZELIA NUTTALL (1857-1933), profesora honoraria del Museo nacional de Mexico. Nota bio-

bibliografica. 12 p., port. Secretaria de educacion publica, publicaciones del Museo nacional, México, 1933. ISIS

XXth century

A. — *Mathematics*

Loewy, Alfred (1873-1935). Obituary by ADOLF FRAENKEL. *Scripta mathematica* 5, 17-22, port., 1938. ISIS

B. — *Physical sciences and technology*

Rutherford, Lord. Transmutation of matter. *Nature* 141, 58-61, 1938. ISIS

" Shortly before his death on October 19 last year, Lord RUTHERFORD completed the presidential address which he proposed to deliver at the meeting of the Indian science congress association on January 3-9. The latter part of the address is here reproduced and represents Lord RUTHERFORD's last pronouncement on a subject with which his name will always be associated. Other matters discussed by him in the address were referred to in last week's leading article."

Sampson, R. A. JOHN KNIGHT FOTHERINGHAM (1874-1936). *Isis* 27, 485-92, 1 pl., 1937. ISIS

Singer, Charles. JOHN KNIGHT FOTHERINGHAM, 1874-1936. *Archeion* 19, 172-78, 1937. ISIS

C. — *Natural sciences*

Ditmars, Raymond L. The making of a scientist. XIV+258 p., 41 illus. New York, MACMILLAN, 1936 ($2.75). ISIS

This is an autobiographical sketch interspersed with accounts of the natural history of amphibians, reptiles, birds, monkeys, and rare mammals of tropical America and the author's noteworthy meteorological experiences. His accounts concern his youthful experiences with reptiles, his association with the entomologist, J. B. SMITH, and the early history of the American museum of natural history in New York. C. A. K.

Hobbs, William H. A footnote to university history. The first and second advents of Dr. COOK. *Michigan alumnus quarterly review* 42, 643-46, 1935. ISIS

Hobbs, William H. Memorial of CHARLES WILFORD COOK. *Proceedings of the geological society of America* 181-84, 1 pl., 1933. ISIS

Peary's journey to the Pole. Notes by HUGH C. MITCHEL and CHAS. R. DUVAL on the review of " PEARY " in *Geographical journal*, March 1937 and reply by the reviewers, A. R. H., and J. M. W. *Geographical journal* 90, 164-68, 1937. ISIS

Roback, A. A. Behaviorism at twenty-five. 256 p. Cambridge, Mass., Sci-art, 1937. ($1.75). ISIS

ROBACK's *Behaviorism and psychology* (Cambridge Mass., 1923) was reviewed in *Isis* 6, 112-15. This is a supplementary volume surveying the history of the first quarter of a century of " behaviorism "; it might have been entitled " The passing of behaviorism." Contents : 1. Historical introduction; 2. Twenty-five years of behaviorism; 3. Behaviorism " revolutionizes " education; 4. Progress in psychology; 5. Threshing out the issues; 6. Taking the cue; 7. Behavioristic experiments; 8. Who's who in behaviorism; 9. Behaviorism in the light of Dr. WATSON; 10. Bibliography. Indexes. G. S.

D. — *Medical sciences*

Bett, Walter R. DAVID FRASER FRASER-HARRIS (1867-1937). *Medical life* 44, 333-35, port., 1937. ISIS

Bordet, Jules. Notice sur la vie et les travaux de CHARLES NICOLLE (1866-1936). *Rapport de l'Université libre de Bruxelles sur l'année académique* 1935-1936, p. 93-4, Bruxelles, 1937. ISIS

Danis, Marcel. Notice sur la vie et les travaux de ÉMILE GALLEMAERTS (1860-1935). Avec une bibliographie. *Rapport de l'Université libre de Bruxelles sur l'année académique* 1935-1936, p. 85-9, Bruxelles, 1937. ISIS

Faure, J. L. Les films chirurgicaux. *Bulletin de la société française d'histoire de la médecine* 31, 245-48, 1937. ISIS

Tricot-Royer, Dr. JEAN-GÉRARD DE LINT (1867-1936), historien de la médecine. *Bulletin de la société française d'histoire de la médecine* 31, 197-208, 1937. ISIS

E. — *Alia*

Kratchkovskii, I. J. IGNAZIÓ GUIDI. *Bulletin de l'Académie des sciences de l'URSS*, classe des sciences sociales, p. 531-40, 1936 (en russe, le tiré à part porte la date 1937). ISIS

The march of science. A first quinquennial review 1931-1935 by various authors issued under the authority of the council of the British Association for the advancement of science. VIII+215 p. London, PITMAN, 1937. (3/6). ISIS

This book was planned to discharge through a new channel one of the functions of the Association prescribed by its founders in 1831, namely : " To obtain more general attention for the objects of science." This was foreshadowed by WILLIAM WHEWELL at the first meeting of the Association, who wrote : " a collection of reports concerning the present state of science, drawn up by competent persons, is on all accounts much wanted; in order that scientific students may know where to begin their labours, and in order that those who pursue one branch of science may know how to communicate with the inquirer in another." The book contains succinct, as a rule well-balanced, and clearly stated synopses of research of most significance in sixteen fields of science. The fields and authors are : Cosmical physics, J. H. JEANS; Geology, P. G. H. BOSWELL; Geography, G. R. CRONE; Botany, F. E. WEISS; Zoology, G. R. DE BEER; Anthropology, A. C. HADDON; Psychology, J. C. FLUGEL; Educational science, A. G. JONES; Economic science, JOSIAH STAMP; Agricultural science, J. A. S. WATSON; Physiology, L. E. BAYLISS; Biochemistry, F. G. HOPKINS; Physics, ALLAN FERGUSON; Physical chemistry, IRVINE MASSON; Organic chemistry, E. F. ARMSTRONG; and Science and industry, F. E. SMITH. The historical values of such surveys lie in their immediacy and authenticity. They will be all the more valuable when the perspective of time shall permit their revaluation. C. A. K.

Rand, Edward Kennard. Classical and mediaeval studies in honor of EDWARD KENNARD RAND. Presented upon the completion of his fortieth year of teaching. Edited by LESLIE WEBBER JONES. IX+310 p., 6 pl. New York, the Editor, Butler Hall, 400W. 119th St., 1938. ISIS

Thompson, James Westfall. Medieval and historiographical studies in honor of JAMES WESTFALL THOMPSON. Edited by JAMES LEA CATE and EUGENE N. ANDERSON. X+499 p., port. Chicago, University Press, 1938. ISIS

PART II

HISTORICAL AND ETHNOGRAPHICAL CLASSIFICATION

I. — ANTIQUITY

1. — ANTIQUITY (*generalities*)

Farrington, Benjamin. Science in antiquity. 257 p. (Home University library of modern knowledge). London, BUTTERWORTH, 1936. ISIS

Reviewed by AUBREY DILLER, *Isis* 27, 512-13, 1937.

Przyluski, Jean. Nouveaux aspects de l'histoire des Scythes. Les Scythes et la propagation de la civilisation de Hallstatt. *Revue de l'Université de Bruxelles* 42, 209-23, 293-307, 1936-37. ISIS

2. — EGYPT

Lippmann, Edmund O. von. Das Natron im alten Ägypten. *Die Naturwissenschaften* 25, p. 592, 1937. ISIS

Simons, J. (S.J.). Handbook for the study of Egyptian topographical lists relating to western Asia. 224 p., frontispiece, 6 fig. Leiden, BRILL, 1937. ISIS

3. — BABYLONIA AND ASSYRIA

Bortolotti, Ettore. Osservazioni sull'algebra babilonese. *Archeion* 19, 192-95, 1937. ISIS

Eliade, Mircea. Cosmologie si alchimie babiloniană. 135 p. Vremea, 1937. ISIS

Galpin, Francis W. The music of the Sumerians and their immediate successors, the Babylonians and Assyrians. Described and illustrated from original sources. XIV+110 p., 12 pl. Cambridge University Press, 1937. ISIS

" Thirty-six different forms of ancient instruments are here described and illustrated from contemporary representations and extant examples; the place that music occupied in temple ritual and civil life is discussed; and the musical scale in use is examined. For the first time a staff translation of the cuneiform notation is presented, the example being a harp accompaniment to a Sumerian hymn of c. 2000 B.C. Out of his wide knowledge of the ancient distribution of musical instruments, Dr. GALPIN suggests points of contact with other cultures that may help to elucidate the origin of the Sumerians and their place in the history of art."

Neugebauer, Otto. Zum astronomischen Papyrusfragment Pap. Osl. 73. *Symbolae Osloenses*, fasc. 17, 49-53, 1937. ISIS

" Die Lückenhaftigkeit unserer Kenntnisse über die Geschichte der antiken Astronomie drückt sich besonders deutlich darin aus, dass fast jedes neue Textfragment, das dem Boden Ägyptens oder Mesopotamiens entsteigt, Tatsachen ans Licht bringt, die aus den bisherigen Quellen noch nicht bekannt waren. Um so wichtiger ist es, auch unsere Anschauungen immer wieder an Hand der Texte zu revidieren und alle Hypothesen auszuscheiden, die einst auf Grund noch unzureichender Unterlagen aufgestellt worden sind. Die folgenden Bemerkungen mögen als kleiner Beitrag in dieser Richtung aufgefasst werden."

Smith, David Eugene. Algebra of 4000 years ago. Second note. *Scripta mathematica* 5, 15-16, 1938. ISIS

Thureau-Dangin, François. La clepsydre babylonienne. *Revue d'assyriologie* 34, 144, 1937. ISIS

Vogel, Kurt. Babylonische Mathematik. II. Beiträge. Blätter f. d. Gymnasialschulw. 71, 16-29, (received Nov. 1937). ISIS

Vogel, Kurt. Bemerkungen zum Nachleben der babylonischen Mathematik. *Congrès international des mathématiciens.* Oslo 1936, 2 p. ISIS

4. — GREECE

Gossen, Hans. Hat es im Altertum Spezialärzte für Geburtshilfe gegeben? *Zentralblatt für Gynäkologie* 61, 1934-35, 1937. ISIS

Ligeros, Kleanthes A. How ancient healing governs modern therapeutics. The contribution of Hellenic science to modern medicine and scientific progress. 523 p., ills. New York, PUTNAM, 1937 ($10.00). ISIS

In this work we have an example of a dangerous and pernicious type of book. Well produced, handsomely illustrated and well documented, it would seem to be an authoritative work. These features serve but to camouflage a thesis which would embrace all cultism, with special emphasis on osteopathy and chiropractic, and justify these therapeutic measures on the grounds of their origin in ancient Hellas, presenting HIPPOCRATES in a new role—the master chiropractor.

The quoted authorities make strange bedfellows, for we find rubbing shoulders such leaders in the fields of the history of science and medicine as SARTON, SINGER, CUMSTON, CLIFFORD ALLBUT, GOLDTHWAIT, with STILL, PALMER and ABRAMS.

Much of the historical portion reads like a testimonial to ancient Greece matched by the personal tribute to the author facing the first chapter. The author will have but little for other ancient civilizations. To what absurdities his all embracing Hellenism will carry him is perhaps well illustrated by his fantastic etymologies. For example he derives *Glasgow* from γλαύξ, an owl, enough to fire the Gaelic " dark green glen."

With regard to therapeutics the author fails to appreciate that modern medicine has in becoming scientific, eschewed and logically has no place for sectarianism. Modern medicine does not depend upon a theory.

This work deserves brief notice because its physical nature would give some semblance of authority whereas it is in principle bad medicine and worse history. J. B. DE C. M. S.

Wiberg, Jul. The medical science of ancient Greece : the doctrine of the heart. *Janus* 41, 225-54, 1937. ISIS

5. — ROME

Delatte, Louis. Recherches sur quelques fêtes mobiles du calendrier romain. *L'antiquité classique* 6, 93-117, 1937. ISIS

Gossen, H. Der Arzt im alten Rom. *Ciba Zeitschrift* Nr. 48, 1646-71, figs. ISIS

Contents : Zeittafel; Das Erbe Griechenlands und die medizinische Lehre im alten Rom; der Arzt im Alten Rom; Die Heilmethoden der römischen Ärzte; Altrömischer Heilaberglaube; Von der Hygiene im Alten Rom.

II. — MIDDLE AGES

6. — MIDDLE AGES (*generalities*)

Bréhier, Émile. La philosophie du moyen âge. Coll. l'Évolution de l'humanité. 460 p. Paris, MICHEL, 1937 (40 fr.). ISIS

Bühler, Curt F. Greek philosophers in the literature of the later Middle Ages. *Speculum* 12, 440-55, 1937. ISIS

Calmette, Joseph. Le monde féodal. 496 p. Paris, Presses universitaires, 1937 (60 fr.). ISIS

Collinder, Per. Studies in Spanish sources I. A mediaeval series of statements on the colours of the planets. 16 p. *Meddelande från Lunds astronomiska observatorium* ser. II, Nr. 88, historical notes and papers, no. 10, 1937. ISIS

Hoffleit, Herbert B. A Latin medical manuscript. *Studies in honor of E. K. Rand*, 133-41, 1938. ISIS

" Among the books of the late Professor S. L. MILLARD ROSENBERG of the University of California at Los Angeles were a number of rare volumes on subjects illustrative of the history of medicine in which he had a great interest, several of them in Latin. One was a vellum manuscript of apparently the XIIIth century, bound in pigskin but fragmentary at both beginning and end. It appears to have once been in the hands of the well known collector Dr. VOLLBEHR who numbered it 15683 in his collection and before that to have been at Milan whence it derived a designation Receptorium Milanense. The present writer was asked to translate and partially transcribe the work with a view to extracting whatever might seem

worthy of publication with a commentary by Professor ROSENBERG. Some preliminary work had been laboriously done without pretense to special knowledge of palaeography or medicine when Professor ROSENBERG's death interrupted for good the execution of his larger plan."

Levy, Raphael. Répertoire des lexiques du vieux français. x+65 p. New York, Modern language Association of America, 1937. ISIS

" Cette bibliographie a pour objet de présenter d'une façon systématique les titres de toutes les listes alphabétiques des mots du vieux français qui ont été imprimées jusqu'ici. La période étudiée s'étend du début de la littérature française au quinzième siècle inclusivement, avec un appendice pour les auteurs modernes. Nous avons essayé d'examiner tous les ouvrages philologiques et toutes les éditions de textes susceptibles d'offrir un glossaire. Aux livres mentionnés nous avons ajouté les annonces récentes d'éditions et de lexiques en cours de préparation. Chaque annonce indique l'Université, à laquelle appartient l'auteur des travaux entrepris, afin qu'on sache où demander des renseignements plus précis."

Mac Kinney, Loren C. Medieval medical dictionaries and glossaries. *Medieval and historiographical studies in honor of James Westfall Thompson*, p. 240-68, 1938. ISIS

" Much has been made of the medieval tendency to epitomize past information rather than to seek new knowledge. Truly the Middle Ages were slow in developing the spirit and equipment for original research. Glossaries, concordances, dictionaries, encyclopedias, and *summa* were more prevalent than monographs. But the inference, often drawn, to the effect that the compilers of such compendia were *ipso facto* unintelligent pedants is unwarranted. Many of the medieval epitomizers were so successful that their compilations have stood the acid test of time. From pre-Carolingian Gaul, a period and region that are sometimes designated as the darkest of the dark ages, came the *Liber glossarium*, which DU CANGE centuries later used as the basis for his great *Glossarium*." An interesting and well documented discussion of medieval medical compendia. M.C.W.

III. — ORIENTAL SCIENCE AND CIVILISATION

8. — EASTERN ASIA

(Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined)

Eliade, Mircea. Barabudur, templul simbolic. *Revista fundaţiilor regale* nr. 9, 15 p., 1937. ISIS

Suzuki, Daisetz Teitaro. An introduction to Zen Buddhism. 170 p. Kyoto, Eastern Buddhist Society, 1934. ISIS

Reviewed by S. S., *Isis* 27, 514, 1937.

Suzuki, Daisetz Teitaro. The training of the Zen Buddhist monk. With illustrations by ZENCHU SATO. XIV+111 p., 43 pl., illus. Kyoto, Eastern Buddhist Society, 1934. ISIS

Reviewed by S. S., *Isis* 27, 514-15, 1937.

Thompson, Virginia. French Indo-China. 517 p. New York, MACMILLAN, 1937 ($5.00). ISIS

This excellent volume, published for the American Council, The Institute of Pacific Relations, presents a study of the contacts of cultures and of French administration in Indo-China. Unquestionably Dr. THOMPSON has written the best cross-sectional study of Indo-China which is available in any language. In the course of the book the author manages to touch upon so great a variety of things that one does not necessarily need to have a particular interest in Indo-China to read her book with pleasure and with profit. To those with an interest in this little known region of the world, in its cultures, its peoples, its past, present, and future, the volume will prove indispensable.
M. F. A.-M.

9. — INDIA

Collins, Mark. On the octaval system of reckoning in India. 28 p. (University of Madras, Dravidic studies, 4). Madras, Diocesan Press, 1926. ISIS

Cultural heritage of India, The. A symposium by some 100 authors. 3 vols. XXVI+1917 p., 164 ill. Belur Math. Calcutta : SRI RAMAKRISHNA centenary committee, n.d. (1937). ISIS

Reviewed by A. K. COOMARASWAMY, *Journal of the American oriental society* 57, 426-28, 1937.

Eliade, Mircea. Plants and plant-life as understood by the ancient Hindus. *Bulletin de la société des sciences de Cluj*, 6, 221-37, 1931 (in Rumanian). ISIS

Summary : " This paper is an attempt to collect and interpret the data of ancient Indian botanical lore. The author discusses the Sanskrit and Prakrit nomenclature of plants, and this ancient taxonomy proves a very keen gift of observation and rich suggestive power. The Hindu classification of plants is similar to that of the European botanist before LINNAEUS, being grounded on the essential features of the plants. Some truths concerning the physiology of the vegetable realm had been known in India from the Vedic age, as for instance : the diurnal and noctural movements of plants, assimilation and circulation of sap, respiration, sensibility, sleep, the importance of the solar rays in the growth of plants, etc. Reference to the sexuality and consciousness of plants are to be met with in a great number of treatises and commentaries. The majority of these botanical truths have been

discoverd empirically, and do not prove a systematic and scientific process, but rather an intuitive and pragmatical knowledge. The identity of the human being with the vegetable realm is emphasized in the Jaina Sutras. The author quotes texts from *Âkârânga Sutra* which have escaped the attention of the previous writers on the subject. The unity of the organic world is a leit-motif of Indian speculation, and it is patent even in the scientifical works. It is worth knowing that the actual researches and discoveries of Sir JAGADIS BOSE have been known, intuively, twenty-five centuries ago. The author finds traces of the first systematic interpretation of nature in the Jaina-Sutras, and discusses the botanical fragments of Indian literature from MASHKARIN GOSHALA (VI B.C.) until the medieval Hindu, Jain and Buddhist commentators."

Eliade, Mircea. Lo Yoga e la spiritualità indiana. *Asiatica* 3, fasc. 4, 14 p. Rome, 1937. ISIS

Garratt, G. T. The legacy of India. With an introduction by the Marquis of Zetland. XVIII+428 p., 24 pl., map. Oxford, Clarendon Press, 1937. ISIS

Reviewed by A. K. COOMARASWAMY, *Journal of the American oriental society* 57, 426-28, 1937.

Müller, Reinhold F. G. Die Herz-Lehre der altindischen Ärzte. *Janus* 41, 261-93, 1937. ISIS

Paramasivan, S. The mural paintings in the Brihadisvara temple at Tanjore—an investigation into the method. *Technical studies in the field of the fine arts* 5, 221-23, 1 fig., 1937. ISIS

Reddy, D. V. S. The art of surgery in ancient Indian sculptures. *Bulletin of the institute of the history of medicine* 6, 81-7, 2 fig., 1938. ISIS

Rutherford, of Nelson, Lord. Science and industry in India. *Science* 87, 75-9, 1938. ISIS

Sarma, D. S. Lectures on the Bhagavad Gita. With an English translation of the Gita. XIII+213+VIII p. Published by N. SUBBA RAU PANTULU, president of the Hindu Samaj, Rajahmundry, 1937 (Western agent, LUZAC, London ; price, 3 s.). ISIS

The *Bhagavadgîtâ* was first revealed to the Western world by the English version of Sir CHARLES WILKINS (London 1785) and since that time, a good many other Western translations have appeared, most of them of course in English. Indeed one of these English versions, by Mrs. ANNIE BESANT

(London 1895) has revealed the Book not only to Westerners but also to many Hindus unable to read it in Sanskrit. Western commentators (except theosophists like Mrs. BESANT) have often been led to attach too much importance to mythological and archaeological discussions, which however interesting, are somewhat irrelevant. Where was the *Gîtâ* written? Opinions vary greatly. One of the latest critics, W. DOUGLAS P. HILL (in his very convenient Sanskrit-English edition, Oxford Press 1928) concludes that the most probable date is the second century B.C.. However, the *Gîtâ* is *timeless* and it is better to consider it as a flower, perhaps the finest flower, of the Hindu metaphysical genius, without trying to find out exactly when and where it flourished. Dr. SARMA's commentary is precious because it is the interpretation of a poet and *yogin*. it is wise and sensitive. Moreover, it is enriched with a noble preface by Sir S. RADAKRISHNAN and contains appreciations of the *Gîtâ* by MAHATMA GANDHI, by LOKAMANYA BALA GANGADHARA TILAK, and by pandit MADAN MOHAN MALAVIYA. Said the latter : " This wonderful book of eighteen small chapters contains the essence of the *Vedas* and the *Upanishads* and is a sure guide of the way to perfect happiness here as well as hereafter. It preaches the threefold way of Knowledge, Devotion and Action, leading to the highest knowledge, the purest love and the most luminous action. It teaches self-control, the three-fold austerity, non-violence, truth, compassion, obedience to the call of duty for the sake of duty and putting up a fight against unrighteousness *(adharma)*." (p. 95.) Dr. SARMA is Principal of the government Arts College in Rajahmundry. I warmly recommend his book; it is an excellent introduction to the *Gîtâ*, and includes an English version of it. G. S.

Sharpe, Elizabeth. An eight-hundred year old book of Indian medicine and formulas. Translated from the original very old Hindi into Gujarati character and thence into English. 135 p. London, LUZAC, 1937. ISIS

10. — CHINA

Boodberg, Peter A. Some proleptical remarks on the evolution of archaic Chinese. *Harvard journal of Asiatic studies* 2, 329-72, 1937. ISIS

Read, Thomas T. Chinese iron—a puzzle. *Harvard journal of Asiatic studies* 2, 398-407, 1937. ISIS

Ritchie, Patrick D. Spectrographic studies on ancient glass. Chinese glass, from pre-Han to T'ang times. *Technical studies in the field of the fine arts* 5, 209-20, 1937. ISIS

11. — JAPAN

Fujikawa, Yu. Nihon shippei-shi (History of epidemic diseases in Japan). With introductions by AKIRA FUJINAMI and KENSABURO OGAWA. Vol. 1, 342 p., pl., ill. Tokyo, Toô-dô, 1912. ISIS

Inspired by the German and British studies of various epidemic diseases, Dr. FUJIKAWA undertook to write a brief history, but since early Japanese records mention the plagues only in the briefest manner it was very difficult for him, if not impossible, to identify the diseases. For example, in 93 A.D. there was " a great pestilence and people died as if none were to be left," but as to its nature we know nothing. Since the primitive Japanese believed any such affliction to be due to the divine anger, they made offerings to the deities, and " the pestilential vapour ceased altogether." During the middle ages, there was an annual festival of driving out the god of pestilence. When discontented spirits of the dead brought the epidemic, a special service both according to Buddhist and Shinto rites were performed. Special charms were sold by the temples. Carrying garlic in one's sleeves or rubbing his nose with it was considered efficacious. Isolating the victims and fumigating the houses were already known in the early 15th century.

The author deals in turn with small-pox, chicken pox, measles, German measles, cholera, influenza, typhoid fever, and dysentery, and gives their complete history in Chinese and Japanese sources together with their cause, symptoms, and cure. An extended bibliography follows each chapter. A chronological table of various diseases is included in the introduction.

The second volume was never published. S. S.

Fukagawa, Shindô. Ômura-han no igaku (History of medical science in the Ômura feudal clan). 274 p., pl., ill., facs., map. Tokyo, Kato shokai, 1930 (Y. 20.00). ISIS

Situated by the Ômura Bay and almost next door to the city of Nagasaki, the Ômura clan came into close contact with Western science. The first Jesuit missionary settled in its territory in 1556, and Chinese and Dutch medicine flourished side by side. There was, however, no outstanding contribution in the field of medicine by this clan. The author painstakingly collected all the biographical data of physicians and appends chronological and genealogical tables of the local physicians. Since the author is not a scholar or a physician, the present work is unfortunately a jumble of unrelated facts put down uncritically. S. S.

Mizuki, Kozue. Nihon sûgaku shi (History of Japanese mathematics), with an introduction by SHIGEYASU TOKUNAGA. 532 p. Tokyo, Kyôiku kenkyû-kai, 1928. ISIS

Reviewed by SHIO SAKANISHI, *Isis* 27, 525-26, 1937.

Tanaka, Tetsukichi. Ka etsu nô ni okeru sûgaku (Mathematics in the Kaga feudal clan). 134 p., pl. Kanazawa, 1936. ISIS

Reviewed by SHIO SAKANISHI, *Isis* 27, 524, 1937.

12. — ISRAEL

(Including works devoted to Palestine)

Brierre-Narbonne, Jean-Josephe. Exégèse apocryphe des prophètes messianiques. 138 p., autographiées. Paris, GEUTHNER, 1937. ISIS

Dhorme, E. L'évolution religieuse d'Israël. T. I. La religion des Hébreux nomades. 370 p. Paris, GEUTHNER, 1937 (125 fr.). ISIS

Freed, Alexander. A worthy or a wordy Hebrew medical nomenclature. *Harofé haivri, The Hebrew medical journal* 2, p. 114-28, (in Hebrew) 1937. ISIS

Gordon, Benjamin L. Ophthalmology in the Bible and Talmud. *Harofé haivri, The Hebrew medical journal* 2, p. 77-92 (in Hebrew), p. 256 (in English), 1937. ISIS

Harim, Nahum ben; Kagan, Solomon R. Nutrition according to the Talmud. *Harofé haivri, The Hebrew medical journal* 2, p. 92-113 (in Hebrew), p. 251 (in English), 1937. ISIS

Marx, Alexander. Medical manuscripts. *Harofé haivri, The Hebrew medical journal* 2, p. 145-49, (in Hebrew) 1937. ISIS

Rabinowitz, Solomon. Comments on Hebrew medical terminology. *Harofé haivri, The Hebrew medical journal* 2, p. 129-44, (in Hebrew) 1937. ISIS

14. — ISLAM (*also Arabia*)

Blake, Robert P. The circulation of silver in the Moslem East down to the Mongol epoch. *Harvard journal of Asiatic studies* 2, 291-328, 1937. ISIS

"Shortly before the year 1000 A.D. a remarkable, omnipresent shortage of silver affected the Mahometan world. Within a brief space of time it practically ceased to be coined at all in the majority of the Islamic states and fractional currency in base metals took its place alongside of the gold dinars, which continued to circulate. A scant three centuries later (about 1260) silver suddenly reappears in vast quantities, and within a generation is reëstablished as a medium of currency over almost the whole area whence it previously had so mysteriously vanished."

Farmer, Henry George. Turkish instruments of music in the seventeenth century, as described in the *Siyâḥat nâma* of EWLIYÂ CHELEBÎ. Translation edited with notes. VI+45 p., 2 pl. (Collection of oriental writers on music, 3). Glasgow, Civic Press, 1937 (6 s.). ISIS

Valuable supplement to the knowledge of Turkish music provided by the late RA'ÛF YEKTÂ bey of Constantinople to LAVIGNAC's *Encyclopédie*

de la musique (Paris 1922). EWLIYÂ CHELEBÎ (1611- c. 1669) describes or mentions some 76 instruments. One of those he mentions is the qurnâṭa of which EWLIYÂ says, " Invented in England. Made of horn. Played by the monks at the Holy Sepulchre." This is very probably the clarionet. G. S.

Galdston, Iago. Medical explorers of Arabia. *Bulletin of the New York Academy of medicine* 13, 512-38, 1937. ISIS

Grant, Christiana Phelps. The Syrian Desert. XVI+410 p., Ill. New York, MACMILLAN, 1938 ($5.00). ISIS

The first European to cross the Syrian Desert, from Aleppo to Basra, was ANTONIO TENREIRO a Portuguese Jew who made the journey, and back again, in 1523 (*Itinerario*, Lisbon, 1560). Since TENREIRO's time an increasingly greater interest has been shown in this peculiarly interesting region of the world, a region of the world which has played a distinctive part in the history of civilization. In the present work Dr. GRANT has written a variegated " outline " history of the Syrian Desert, in which its peoples, the trade routes, the caravans, the travellers, and the explorers, down to the present time, are all interestingly dealt with and discussed. Dr. GRANT is to be congratulated on the performance of a difficult task well executed. If the book has a fault it is that it is not as detailed in many places as could have been wished, but this cannot be seriously called a fault in a work which claims to be no more than an "outline"; the work, however, is more than that. The scholar and the general reader alike will find much to interest them in this volume. There are useful glossaries of native terms; a good selected bibliography and an index completes the work. M. F. A.-M.

Levi della Vida, Giorgio. Appunti e quesiti di storia letteraria araba. 5. " Almanacco." *Rivista degli studi orientali* 14, 265-70, 1933. ISIS

Discussion of the term almanac, completing and correcting my note in *Isis* (10, 490-93, 1928). The word *manâkh* is connected with the root *mkh* kneeling of the camel to be loaded. *Manâkh* (or more exactly *munâkh*) is the place where the camel kneels, hence station; hence station in an astronomical sense. G. S.

Levi della Vida, Giorgio. Appunti e quesiti di storia letteraria araba. 7. Numerali greci in documenti arabo-spagnoli. Rivista degli studi orientali 14, 281-83, 1933. ISIS

Apropos of A. GONZÁLEZ PALENCIA : *Los Mozárabes de Toledo en los siglos XII y XIII* (Madrid 1926-30; *Isis* 15, 183-87). Some of the numerals used in these Mozarabic documents are derived from Greek minuscules " Come mai la numerazione greca è penetrata nella Spagna della fine del XII secolo? Vi è giunta attraverso gli Arabi (il che appare poco verosimile, giacchè, a quanto so, essi non l'hanno mai adoperata)? oppure per l'intermedio

dell'Europa latina? E si trova quella numerazione in documenti latini in Spagna o fuori di Spagna? L'ipotesi di un'importazione diretta dal mondo bizantino, attraverso il commercio catalano, sarebbe seducente; ma i documenti la confermano?" G. S.

Samaha, Abdel Hamid Mahmoud. The Arabic names of the stars. 7 p. *Meddelande från Lunds astronomiska observatorium*, ser. II, nr. 89, historical notes and papers, no. 11, 1937. ISIS

IV. — NEW WORLD AND AFRICA

(a) AMERICA

Bell, Willis H.; Castetter, Edward F. The utilization of mesquite and screwbean by the aborigines in the American Southwest. University of New Mexico bulletin (*Ethnobiological studies in the American Southwest*, 5), 55 p., 1937. ISIS

Lee, D. Demetracopoulou. Conceptual implications of an Indian language. *Philosophy of science* 5, 89-102, 1938. ISIS

Leechman, Douglas. Native paints of the Canadian West coast. *Technical studies in the field of the fine arts* 5, 203-08, 4 fig., 1937. ISIS

Strong, William Duncan; Kidder, Alfred, II; Paul, A. J. Drexel, jr. Preliminary report on the Smithsonian Institution—Harvard University archeological expedition to Northwestern Honduras, 1936. *Smithsonian miscellaneous collections*, 97, no. 1, 129 p., 16 pl., 1938. ISIS

Wallis, Wilson D. Medicines used by the Micmac Indians. *American anthropologist* 24, 24-30, 1922. ISIS

(b) OCEANIA

Chewings, Charles. Back in the Stone Age. XXI+161 p., ill. Sydney, ANGUS & ROBERTSON, 1936 (7/6). ISIS

Dr. CHEWINGS has spent almost fifty years in Central Australia, and in this book he writes of the land and the natives. The work intended for the general reader contains much of interest to the student of early society, and where Dr. CHEWINGS reports his own observations he is occasionally able to illuminate an obscure point, and to confirm the interpretations previously given to others. A valuable feature of the book are the

illustrations, a number of which are from unpublished photographs taken by the late F. J. GILLEN who originally collaborated with BALDWIN SPENCER on the great pioneering work of Australian ethnology, *The native tribes of Central Australia*, London, 1899. M. F. A.-M.

Emerson, Rupert. Malaysia. XII+536 p. New York, MACMILLAN, 1937 ($5.00). ISIS

A most valuable study of the origin, development, and present status of direct and indirect rule in Malaysia. M. F. A.-M.

Idriess, Ion L. Over the range. X+316 p. Sydney, ANGUS & ROBERTSON, 1937 (6/-). ISIS

This book provides a most attractive account of the author's experiences while accompanying a police patrol for some twelve hundred miles through the Kimberleys of North-West Australia. The author's sympathy for the little known natives of this region is manifest throughout the book. The book, apart from its more general interest, is of particular interest to the scientist for the reason that it contains a valuable account of native message-sticks. A number of message-sticks are figured and the natives' own interpretation of the markings upon them are given in some detail. Since such message-sticks probably represent the most primitive form of writing for communicatory purposes they are naturally of the greatest interest. The markings on these sticks do not represent characters or letters, but they do represent *symbols;* symbols, however, which are understood only by the sender, the carrier, and the receiver after they memorised meaning of the symbols have been explained to him. There appear to be some markings which do possess a certain generally understood conventional meaning between hordes of the same tribe; among members of the same horde, but for whom a particular message was not intended, " a queerly shaped notch representing a familiar lagoon might be deciphered as to locality; the half-moon or sun mark might betray the time; the notches representing men and women could be distinguished, but the sense of the message would be missing." (p. 104). The symbol given for the new moon on one of these message-sticks is clear enough to anyone, and is probably correctly regarded as an ideograph, the remainder, at best, could be but locally understood. A thorough study of Australian message-stocks is an urgent desideratum. Mr. IDRIESS is to be congratulated upon having obtained the native interpretations of the message-sticks he describes in his fascinating, well illustrated book. M. F. A.-M.

Williamson, Robert W. Religion and social organization in Central Polynesia. XXXI+340 p. Cambridge University Press, 1937 ($9.00). ISIS

Central Polynesia is a region of the world which ethnologically has been extremely well served by the labours of R. W. WILLIAMSON. The present volume, which is a continuation of the same author's *Religious and cosmic beliefs of Central Polynesia*, together with his *The social and political systems*

of Central Polynesia, bring together a vast amount of material on the cultures of this region which will always be of the greatest service to the student of anthropology. The present volume has been edited by RALPH PIDDINGTON, himself a distinguished student of the cultures of Oceania. In addition to the task of editing WILLIAMSON'S material, a task which he has carried out most efficiently, he has contributed in the last 150 pages of this book a discussion of religion in general, and of its place in the cultures of Central Polynesia in particular, which all students of primitive religion will want to read. The approach is from the functional standpoint, and it is altogether most excellently done. A very distinguished volume, and a valuable addition to anthropological literature. M. F. A.-M.

(c) AFRICA (*outside Egypt and Islam*)

Field, M. J. Religion and medicine of the Gā people. XII+214 p. New York, Oxford University Press, 1937 ($6.50). ISIS

Dr. FIELD has had unusual opportunities, extending over a number of years, for the study of the religion and magical practices and beliefs of the Gā people of West Africa, and the result is a volume of firstrate importance. Dr. FIELD'S analysis of the Gā conception of magic is most illuminating, and ties up very neatly with Dr. EVANS-PRITCHARD'S observations in the Nilotic Sudan. The work of Dr. EVANS-PRITCHARD and of Dr. FIELD really puts the study of African magical belief upon an intelligible basis for the first time. Where Dr. EVANS-PRITCHARD has approached the subject from the purely ethnological point of view Dr. FIELD has brought to his study the viewpoint of the psychiatrist, a viewpoint which greatly helps to throw a fresh light on problems formerly obscure. The book served as a thesis for the degree of Ph. D., in the University of London, and it is perhaps for this reason that its style is rather formal and dry. It is greatly to be hoped that Dr. FIELD will be enabled to continue his studies in Africa and perhaps in other parts of the world. M. F. A.-M.

Fouché, Leo. Mapungubwe ancient Bantu civilization on the Limpopo. XVI+123 p. Cambridge University Press, 1937 ($15.00). ISIS

Mapungubwe is the name given to a small precipitous sandstone hill situated in the Northern Transvaal which between February 1933 and June 1935 was partially excavated by a group of investigators from the University of Pretoria. The present excellently produced volume represents the reports of the findings made during the excavations by nine authorities and the editor.

A fair number of artefacts in bone, glass, clay, terra-cotta, iron, copper, bronze, and gold, and a quantity of skeletal remains were recovered. The conclusions arrived at as a result of the analysis of this material is that the occupants of Mapungubwe were culturally related to the people of Zimbabwe. How sound this interesting conclusion is it will remain for future students to determine. Meanwhile the work of Mapungubwe, which at the present moment still fruitfully continues, has raised a new hope for South African

archaeology. This volume is the forerunner, we prophesy, of numerous others. In itself it is an achievement upon which the editor and his collaborators, and all South African archaeologists, are to be heartily congratulated. M. F. A.-M.

Palmer, Richmond. The Bornu Sahara and Sudan. VIII+296 p. London, MURRAY, 1936 (42/-). ISIS

Sir RICHMOND PALMER has spent some twenty-six years in various parts of Northern Nigeria, and during much of this time he has occupied himself with the task of assembling materials for a history of the more important ruling groups, such as the Fulbe and Kanuri of Bornu. In this task Sir RICHMOND PALMER has had the co-operation of many Sudanese Muallims and rulers who placed in his hands a large number of manuscripts relating to the history of the Bornu which are in this volume, most of which have presumably been translated by Sir RICHMOND PALMER. The book is a fundamental contribution to the history of Bornu culture, and a unique source book of early materials relating to the area of Bornu Sahara and Sudan. If more of our foreign residents spent their leisure hours as Sir RICHMOND PALMER has done, the cultural history of the world would be so much fuller than it is, or, alas, is likely to be. Sir RICHMOND PALMER has put all students of African cultures deeply into his debt. M. F. A.-M.

PART III

SYSTEMATIC CLASSIFICATION

I. — SCIENCE IN GENERAL

15. — BIBLIOGRAPHY OF SCIENCE

Junk, W. Scientiae naturalis bibliographia. Annus I : 1937, pars 1. 70 p. Den Haag, JUNK, 1937 ($1.10 a year). ISIS

" The ' Scientiae naturalis bibliographia ' will appear twice a year. It shall contain, as far as possible, the titles of all books on natural history and biology and kindred sciences published anywhere in the civilised world during the last six months."

16. — HISTORY OF SCIENCE

Duhem, Pierre (1861-1916). Le no. 2-3 du vol. XIX d'*Archeion* contient une série d'articles consacrés à DUHEM, p. 121-51, Paris, 1937. ISIS

Articles par MAURICE D'OCAGNE, ABEL REY, HÉLÈNE METZGER-BRUHL, ALDO MIELI, PETRU SERGESCU, MAXIME GORCE, comte JEAN DE LA LAURENCIE.

Johnson, Thomas Cary, jr. Scientific interests in the Old South. VI+199 p. (University of Virginia Institute in research in the social sciences, institute monograph 23). New York, Appleton-Century, 1936. ISIS

Reviewed by CARL BRIDENBAUGH, *Isis* 27, 517-19, 1937.

Metzger-Bruhl, Hélène. La méthode philosophique dans l'histoire des sciences. *Archeion* 19, 204-16, 1937. ISIS

Petrus Nonius. Publicação de Grupo português da história das ciências patrocinada pelos Presidentes das secçoes do Porto, Coimbra e Lisboa e pelos membros do Comité central : Prof. A. A. MENDES CORRÊA, JOAQUIM DE CARVALHO, Comte FONTOURA DA COSTA, RICARDO JORGE, e FERNANDO DE ALMEIDA E VASCONCELOS. Director : ARLINDO CAMILO MONTEIRO. Vol. I, fasc. 1 e 2, XI+207 p., Lisboa, 1937. ISIS

Our best wishes to the new journal published by our Portuguese friends and colleagues, ably directed by Prof. ARLINDO CAMILO MONTEIRO. Vivat et floreat Petrus Nonius redivivius ! G. S.

Sarton, George. The history of science and the new humanism. 192 p. Cambridge, Harvard University Press, 1937. ISIS

Reviewed by EDMUND O. VON LIPPMANN, *Geistige Arbeit*, p. 8, Berlin, January 20, 1938.

Sarton, George. The study of the history of science. 75 p. Cambridge, Mass., Harvard University Press, 1936. ISIS

Reviewed by O. G. S. CRAWFORD, *Antiquity* 11, 500-01, 1937.

Schurmann, Pablo F. La historia de la ciencia y su introducción en la enseñanza secundaria. *Anales de la Enseñanza Secundaria* 2, 347-51, 1937. ISIS

Stimson, Dorothy. The teaching of the history of science in a liberal arts college for women. *Annals of science* 2, 460-64, 1937. ISIS

17. — ORGANIZATION OF SCIENCE

(*Internal organization is meant, see* Isis 1, 195.
For external organization, national or international, see section 55).

Le Chatelier, Henry. De la méthode dans les sciences expérimentales. 319 p. Paris, DUNOD, 1936. ISIS

Reviewed by TENNEY L. DAVIS, *Isis* 27, 519-22, 1937.

Moulton, F. R. Science and society. *Science* 86, 387-91, 1937. ISIS

18. — PHILOSOPHY OF SCIENCE

Conklin, Edwin Grant. Science and ethics. *Science* 86, 595-603, 1937; *Nature* 141, 101-05, 1938. ISIS

"Address of the retiring president of the American Association for the advancement of science, delivered at Indianapolis on December 27, 1937."

Dingle, Herbert. Knowledge without understanding. *Atlantic monthly* 116-24, July 1937. ISIS

Dingle, Herbert. Science and the unobservable. *Nature* 141, 21-8, 1938. ISIS

"If we take the realistic view, we are left with an unresolved dilemma, but if we take the idealistic view, the principle becomes simply a statement of the object at which science has aimed throughout its history. It is not my purpose to comment on the age-old problem of idealism versus realism; I am concerned only with the attitude implied in modern scientific developments, and the point I want to emphasize as clearly and unmistakably as possible is that anyone who regards the recent trend of physics in general, and the theory of relativity in particular, as legitimate science or philosophy or intellectual activity bearing whatever name may be thought honourable, must either be an idealist or presume that he is omniscient."

Färber, Eduard. Der Stetigkeits-Gedanke und seine Verwirklichung. *Osiris* 3, 47-68, 1937. ISIS

Hillman, Owen N. EMILE MEYERSON on scientific explanation. *Philosophy of science* 5, 73-80, 1938. ISIS

Huntington, Edward V. The method of postulates. *Philosophy of science* 4, 482-95, 1937. ISIS

Jeans, Sir James ; Bragg, Sir William ; Appleton, E. V. ; Mellanby, Edward ; Haldane, J. B. S. ; Huxley, Julian. Scientific progress. 210 p., 31 fig. New York, MACMILLAN, 1936 ($2.00). ISIS

This is the tenth annual lecture on the Sir Halley Stewart Lecture Trust foundation by leaders in British science in the fields of astronomy, physics, electricity, preventive medicine, genetics, and biology. It is in the main historical in content with emphasis on the present status of the respective sciences and applications to present day concepts of the relations of science to philosophy, ethics, and religion. The first two suggest the basis for freedom and responsibility; the third shows how the inaccessible atmosphere

reveals its secrets through the echoes of the radio waves. The fourth outlines the growth of preventive medicine and its problems still unsolved. The fifth treats of human genetics and human ideals, showing how some defects of mankind might be reduced in incidence or even eliminated and how difficult elimination will be in the cases of others. On the whole he is loth to support compulsory sterilization but favors voluntary action and education. The last, on science and social needs, is a plea for organized research in some much needed fields, and for a more extended use of knowledge now gained, as for example, in dietary needs and in smoke control. C. A. K.

Merton, Robert K. The sociology of knowledge. *Isis* 27, 493-503, 1937. ISIS

II. — FORMAL SCIENCES (knowledge of forms)

20. — MATHEMATICS

Boyer, Jacques. Sûgaku-shi, translated by TSURUICHI HAYASHI. x+230 p., 46 port., facs. 6th edition revised. Tokyo, Okura, 1930 (in Japanese). ISIS

Reviewed by SHIO SAKANISHI and GEORGE SARTON, *Isis* 27, 526, 1937.

Bradley, A. Day. Pennsylvania German arithmetical books. *Scripta mathematica* 5, 45-51, 1938. ISIS

Bures, Charles E. The concept of probability. A critical survey of recent contributions. *Philosophy of science* 5, 1-20, 1938. ISIS

Carathéodory, C. The beginning of research in the calculus of variations. *Osiris* 3, 224-40, 1 facs., 1937. ISIS

Curtiss, D. R. Fashions in mathematics. *American mathematical monthly* 44, 559-66, 1937. ISIS

Gandz, Solomon. The origin and development of the quadratic equations in Babylonian, Greek and early Arabic algebra. *Scientia* 249-57, 1937. ISIS

" As early as 2250 B.C. the science of mathematics was being cultivated in the Babylonian schools, and especially the art of algebra reached a high point of development. The very name *algebra* is a Babylonian term, borrowed by the Arabs, and meaning ' confrontation, equation.' The original types of equation and methods of solution developed by the Babylonians had a peculiar character of their own and were entirely different from those employed in AL-KHUWARIZMI's algebra. But in Greek algebra their traces

may still be recognized. Thus EUCLID in his *Elements* and DIOPHANTUS in his *Arithmetica* still preserve the Babylonian types and methods as the archaic relics and survivals of the ancient schools. In AL-KHUWARIZMI's algebra, however, the antiquated Babylonian methods with their ingenious artifices are entirely rejected. AL-KHUWARIZMI discards the brilliant ideas of the individualistic Babylonian algebra and introduces the classic period of the three standardized methods of solution. This is a summary of an elaborate memoir of the same title which is going to be published soon (*Osiris* III). It contains : 1. A new theory on the Babylonian types of the quadratic equations and on their peculiar methods of solution. 2. A demonstration that EUCLID in his *Elements* and DIOPHANTUS in his *Arithmetica* preserved the ancient Babylonian types and methods. 3. An exposition of the character of AL-KHUWARIZMI's algebra and of its place in the history of mathematics."

Heath, Sir Thomas. Vol. II of *Osiris* dedicated to him. Contains biography by DAVID EUGENE SMITH, bibliography and portrait. ISIS

Hoc, Marcel. Le calcul par les jetons. *Rev. belge de numismatique* 1935, 87, 88-90, 1935. ISIS

Jelitai, József. The history of mathematics in Hungary before 1830. Translated by G. WALDO DUNNINGTON. *National mathematics magazine* 12, 125-30, 1937. ISIS

Kasner, Edward. New names in mathematics. *Scripta mathematica* 5, 5-14, 8 fig., 1938. ISIS

Kloyda, Sister M. Thomas à Kempis. Linear and quadratic equations, 1550-1660. *Osiris* 3, 165-92, 1937. ISIS

" This essay presents a summary of a study of the status of knowledge of simple and quadratic equations in Europe from 1550 to 1660, and the bibliography of primary sources collected in research on the subject. The study was undertaken at the University of Michigan under the direction of Prof. LOUIS KARPINSKI as a contribution to a general historical survey of the evolution of mathematics." There is also, a far more elaborate mimeographed edition (EDWARD Brothers, Ann Arbor, Michigan 1938, XII+141 p.), including some 70 facsimiles.

Loria, Gino. Scritti, conferenze, discorsi sulla storia delle matematichei, raccolti per iniziativa e pubblicati sotto gli auspici della sezione ligure della società " Mathesis ". XV+589 p. Padua, MILANI, 1937. ISIS

Reviewed by C. DORIS HELLMAN, *Isis* 27, 522-24, 1937.

Neugebauer, O. Über griechische Mathematik und ihr Verhältnis zur Vorgriechischen. *Comptes rendus du congrès international des mathématiciens* Oslo. 1936, p. 157-70, 7 fig., Oslo, 1937. ISIS

" Der leitende Gesichtspunkt wird dabei sein, Ihnen zu zeigen, dass wenigstens die Geschichte der antiken Mathematik im Wesentlichen eine Geschichte der *Symbolik* ist. Dabei kann man den Begriff ' antik ' sehr viel weiter fassen, als es im allgemeinen üblich ist. Die Grenze zwischen der antiken Mathematik und der modernen liegt, wie mir scheint, in der Zeit von NEWTON und LEIBNIZ, wird also bestimmt durch die Entstehung der Symbolik der Differential- und Integralrechnung und damit der ganzen modernen Analysis und Mechanik, während alles, was vor dieser Zeit liegt, unter einander viel näher verknüpft ist, als mit der Entwicklung der späteren Zeit. Die Mathematik der Renaissance wiederholt eine Reihe von Entwicklungsschritten, die sich schon einmal ganz ähnlich in der vorgriechischen Mathematik abgespielt haben, und ebenso steht KEPLER den Gedankengängen und Methoden der antiken Astronomie ungleich näher als den Methoden, die die analytische Mechanik nur wenig später entwickelt hat."

Reichenbach, Hans. On probability and induction. *Philosophy of Science* 5, 21-45, 1938. ISIS

Sarton, George. The study of the history of mathematics. 113 p. Cambridge, Mass., Harvard University Press, 1937. ISIS

Reviewed by IRBY C. NICHOLS, *National mathematics magazine* 12, 154-55, 1937.

Sergescu, P. Le développement des sciences mathématiques en Roumanie. Extrait de *La vie scientifique en Roumanie : I. Sciences pures*, 61 p. Bucarest, 1937. ISIS

Cette publication de l'Académie roumaine est fort intéressante et fort utile. L'histoire commence avec la création de la première académie roumaine par le prince HERACLID VODA près de Iasi en 1561, académie illustrée par la présence de RHETICUS, mais hélas, éphémère. Les premiers travaux originaux datent de 1872. La plus grande partie du travail est consacrée au XX^{e} siècle pendant lequel l'essor des études mathématiques a été considérable dans toutes les directions y compris la philosophie et l'histoire des mathématiques. " On a systématiquement omis tous les livres d'enseignement supérieur des mathématiques, imprimés ou polycopiés, publiés en roumain. Il y en a plus de 150, qui constituent le commencement de la littérature mathématique roumaine. Le plus ancien cours de mathématiques supérieures en roumain, un traité de calcul différentiel, fut publié en 1870 par N. CULIANU. Pour donner une idée de la quantité des travaux mathématiques récemment poursuivis en Roumanie, signalons que dans les Comptes rendus de l'Académie des sciences de Paris, on trouve dans l'espace de 15 ans, de 1911 à 1925, 96 notes dues à des auteurs roumains, tandis que le premier semestre 1929 en contient à lui seul 23. Il y a même eu des numéros des Comptes rendus, où l'on trouvait (pour une seule séance) 4 notes mathémati-

ques écrites par des Roumains. Presque toutes les grandes revues mathématiques du monde entier (France, Allemagne, Italie, États-Unis, Pologne, Japon, Suède, Suisse, etc.) ont publié des travaux roumains." (p. 40). L'auteur, mathématicien et historien, était admirablement préparé pour rédiger ce rapport qui sera également précieux pour les Roumains et les étrangers. G. S.

21. — STATISTICS

(History and methods. Tables and generalities. For the applications, refer to the sciences to which they are applied.)

Funkhouser, H. Gray. Historical development of the graphical representation of statistical data. *Osiris* 3, 269-404, 1937. ISIS

1. Introduction; 2. The origin of the graphic method; 3. The expansion of the graphic method in the first half of the nineteenth century; 4. The development of the graphic method during the period of the international statistical congress; 5. The age of enthusiasm in graphics—1860-1900; 6. Recent developments in graphic methods—a critical attitude in their use; Annotated bibliography.

III. PHYSICAL SCIENCES

(Knowledge of inorganic nature)

23. — ASTRONOMY

Collinder, Per. Studies in Spanish sources I. A mediaeval series of statements on the colours of the planets. 16 p. *Meddelande från Lunds astronomiska observatorium*, ser. II, Nr. 88, historical notes and papers, no. 10, 1937. ISIS

Stetson, Harlan True. Sunspots and their effects. XV+201 p., 15 figs., frontisp. New York, Whittlesey House, McGRAW-HILL Book Co., 1937. ($2.00). ISIS

As lecturer and writer, H. T. STETSON is one of the leading popularizers of science in this country; his special field is the no man's land between astronomy and radio. In two previous books, *Man and the Stars* (1930) and *Earth, Radio and the Stars* (1934) he dealt with terrestrial-cosmic relations and with many problems—both solved and unsolved—belonging to the domains of the geophysicist, the meteorologist, the astronomer, the radio engineer—not to mention the psychologist and the philosopher. In the present book, the author discusses, in his informal, entertaining, and lucid style, the nature and the periodicity of sunspots, and the relations between sunspots and terrestrial phenomena. The following selected chapter titles indicate that both scientifically established and highly questionable relationships are surveyed : Sunspots and Human Behavior; Sunspots and

Growing Things; Sunspots and Radio; Sunspots and Business; Weather and Sunspots; Of Sunspots, the Earth's Magnetism, and Carrier Pigeons. The author's conclusions are remarkably conservative, especially if one takes into consideration the temptations offered by the subject matter to a popular lecturer and writer familiar with the rewards of publicity. An appendix gives a table of sunspot numbers, month by month, from January, 1749 to July, 1937. There is a table of contents and a list of illustrations, but the book lacks an index and a bibliography. Numerous authors are mentioned in the text, but if a lay reader should become interested in their writings, he will regret the absence of bibliographical footnotes; popularizers of science and their publishers ought to realize that a bibliographical footnote does not destroy the attractiveness of a page to an intelligent reader. A. P.

24. — PHYSICS

Crawhall, T. C. Very low temperatures, their attainment and uses. A survey of the physical principles underlying the attainment of extremely low temperatures and of their technical and scientific applications, as illustrated in a special exhibition held in the Science museum, March-May, 1936. Book. I, 31 p. 1936 (6d). Book. II, An illustrated descriptive account of the exhibits in a special exhibition held in the Science museum from March to June, 1936, 59 p., figs., 1937 (2 s.). Book III, A symposium of lectures delivered in connection with a special exhibition held in the Science museum from March to June, 1936. 75 p., 1937 (1s. 3d.). London, Science Museum, H. M. Stationery Office, 1936-37. ISIS

" Book one is a concise survey of the subject dealing with the physical principles underlying the attainment of very low temperatures and their scientific and industrial applications. Chapters are also included on temperature and pressure measurement; liquefaction and solidification of gases; storage and transport; and properties of substances at low temperatures. A number of useful tables and illustrations are included, not the least valuable of which is a chart showing the boiling, freezing and critical points of oxygen, nitrogen, hydrogen, helium, etc. Book two. The complementary volume, in which the author was assisted by O. KANTOROWICZ, contains details of a number of experiments, demonstration apparatus and experimental accessories which were specially designed for the exhibition. Book three, is a reprint of lectures delivered in the Science Museum by leading authorities on the scientific and industrial aspects of the subject."

Millikan, Robert Andrews; Roller, Duane; Watson, Earnest Charles. Mechanics, molecular physics, heat, and sound. XIV+ 498 p., 55 pl. Boston, GINN, 1937. ISIS

Reviewed by V. F. LENZEN, *Isis* 27, 527-28, 1937.

Mitchell, A. Crichton. Chapters in the history of terrestrial

magnetism. Chapter II. The discovery of the magnetic declination. *Terrestrial magnetism and atmospheric electricity*, 42, 241-80, 1937. ISIS

" Within a century after the first mention in literature of the nautical compass, we find allusions in the writings of ROGER BACON to the fact that the direction of the magnetic needle does not coincide with the geographical meridian. When, where, and by whom this was first observed is now unknown. At first, this deviation was ascribed to irregularities in the process of magnetisation of the compass-needle, or to faulty methods of observation. But gradually it came to be recognised as a general and world-wide phenomenon and it is probable, though there is no extant record to establish the fact, that this stage was reached in the earlier years of the fifteenth century. Very soon thereafter and certainly not later than 1450, the makers of sun-dials in Germany introduced improvements in their instruments in order to avoid the effects of deviation of the needle. Possibly about the same time, though more probably later, the compass-makers of Holland adjusted their compass-needles with the same object. The Mediterranean navigators continued to use the compass without this adjustment. Finally, no original observation, discovery, or instrumental improvement, as made or effected down to the end of the historical period concerned, can be definitely or exclusively associated with the name of any particular person."

25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY

Bulletin de la Société chimique de Belgique. Numéro jubilaire, 1887-1937 ; 46, no. 8-9, 1937. ISIS

Fascicule consacré à la commémoration du 50e anniversaire de la fondation de la Société chimique de Belgique.

Delépine, Marcel. La synthèse totale en chimie organique. Mémoires de MM. WÖHLER, GERHARDT, M. BERTHELOT, LE BEL, VAN 'T HOFF, JUNGFLEISCH, LADENBURG, PASTEUR. Préface et commentaires. VIII+145 p. (Classiques de la découverte scientifique.) Paris, GAUTHIER-VILLARS, 1937 (21 fr.). ISIS

The continuity of this book depends so much upon the commentaries of Professor DELÉPINE that the work seems really to be a narrative history of the idea and of the fact of the synthesis of organic compounds from the elements, well documented and illustrated with quotations, often very long ones, from the original sources. The principal points around which the narrative is woven are the synthesis of urea by WÖHLER, earlier investigations, the discovery of urea by FOURCROY and VAUQUELIN, the examination of the urine by ROUELLE and by BOURDELIN, some ideas before BERTHELOT on the synthesis of organic compounds, GERHARDT's earlier and later opinions, BERTHELOT's discussion in *La chimie fondée sur la synthèse*, his synthesis of stearin, of formic acid, of acetylene, of ethylene, of alcohol, and of benzene,

structure theory (briefly), VAN 'T HOFF on the formulas of structures in space, LE BEL on the relations which exist between the atomic formulas of organic substances and the rotatory power of their solutions, JUNGFLEISCH's synthesis of *d*- and *l*-tartaric acid from ethylene, LADENBURG's synthesis of coniine, asymmetric decomposition and total asymmetric synthesis. It is a valuable cross-section of the history of organic chemistry, of which as a whole no adequate history exists at present. T. L. D.

Geiser, Samuel Wood. The Negro in American chemistry. *Opportunity*, journal of Negro life, 3 p., no date. ISIS

Lippmann, Edmund O. von. Vol. III of *Osiris* dedicated to him. Contains biography by J. R. PARTINGTON, bibliography and portrait. ISIS

Lippmann, Edmund O. von. Anfänge des chemischen Unterrichtes in Deutschland. *Die Naturwissenschaften* 25, 592, 1937. ISIS

Lippmann, Edmund O. von. Die Anfänge der wissenschaftlichen Chemie. *Die Naturwissenschaften* 25, 591-92, 1937. ISIS

Menshutkin, B. N. Chemistry and the ways of its development (in Russian). 352 p., 140 ill. Moscow, Academy of Sciences, U.S.S.R., 1937. ISIS

This fine textbook of the history of chemistry contains many unusal portraits. It contains more material about Russian chemists and their work than any other textbook which we have seen, but no more than is necessary for a well-balanced account of the development of the science, and in this respect is superior to the texts of those authors who have been unable to delve into Russian sources. Contents : I. Origins of chemistry; II. Greek chemistry; III. Arab alchemy; IV. Alchemy of occidental Europe; V. Practical chemistry during the epoch of Renaissance; VI. New ideas in chemistry in the XVIIth century; VII. Theory of phlogiston; VIII. Pending the fall of the theory of phlogiston; IX. The great chemical revolution; X. Chemical elements during the first half of the XIXth century; XI. Reciprocal combination of chemical elements; XII. Atomic hypothesis in chemistry; XIII. Origin of the molecular conception in chemistry; XIV. Triumph of the molecular doctrine; XV. Weight of atom and its valence; XVI. Visible spectrum of chemical elements; XVII. Chemical elements and the periodic law; XVIII. New chemical elements after the year 1869; XIX. Radioactive elements; XX. Structure of atoms and their mutual cohesion; XXI. Isotopes; XXII. Modern chemical elements and their systematization; XXIII. Interrelations between physics and chemistry; and conclusion. T. L. D.

Partington, J. R.; McKie, Douglas. Historical studies on the phlogiston theory. I. The levity of phlogiston. *Annals of science* 2, 361-404, 1 pl., 1937. ISIS

Pietsch, Erich. Sinn und Aufgaben der Geschichte der Chemie. 33 p. Berlin, Verlag Chemie, 1937. ISIS

" Die an den Chemiker gerichtete Forderung, sich eingehender mit der geschichtlichen Entwicklung seines Faches zu beschäftigen, ist in den letzten Jahren immer wieder erhoben worden, ohne dass im grossen und ganzen dadurch irgend etwas geändert worden wäre; die Geschichte der Chemie ist nach wie vor das Steckenpferd einiger Weniger geblieben, sie ist von der Mehrzahl der Fachkollegen entweder mit stummer Hochachtung oder erhabener Ironie abgetan worden. Trotz dieser—offen zugegeben—verzweifelten Lage auf dem Gebiete der Geschichte der Chemie soll die nachfolgende Auseinandersetzung mit dem der Geschichte der Chemie zugrunde liegenden Sinn und ihren Aufgaben noch einmal versucht werden, heraus aus der vielfältig erhärteten Erfahrung von der hohen Bedeutung einer Beschäftigung mit diesem Gebiet. Um die inneren Zusammenhänge klarer herauszuarbeiten, konnte ein kurzes Eingehen auf die kulturellen Grundströmungen der letzten Jahrhunderte des Abendlandes nicht vermieden werden, da erst durch sie die gewünschte Sinndeutung ermöglicht wird."

Read, John. Prelude to chemistry. An outline of alchemy, its literature and relationship. XXVI+328 p. New York, MACMILLAN, 1937. ISIS

Reviewed by TENNEY L. DAVIS, *Isis* 27, 528-31, 1937.

Robinson, Victor. Coal-tar contemplations. *Medical life* 44, 336-40, 1937. ISIS

Zoccoli, Federico Gambigliani. Alcune poesie alchemiche ritenute inedite. *Rivista di storia delle scienze mediche* 28, 273-82, 1 facs., 1937. ISIS

26. — TECHNOLOGY

(For mining, see 32. *geology; for industrial chemistry,* 25. *chemistry. See also Arts and Crafts under* 45)

Byles, Axtell J. America's petroleum industry. A review and a commentary. An address delivered before Princeton University on December 14, 1937, in the Cyrus Fogg Brackett lectureship in applied engineering and technology. 28 p. Guild of Brackett lecturers, 1938. ISIS

Ferguson, Homer L. The mariners' museum (at Newport News, Va.). 9 p. Paper presented at the annual meeting of The society of naval architects and marine engineers. New York, 1937. ISIS

Technical studies in the field of the fine arts. Volume 5, no. 4, 203-68, figs., Fogg Museum, Cambridge, Mass., 1937. ISIS

This number contains an index to vols. I to V (1932-37).

Vermilye, William M. Power in the textile industry. A brief historical review. 34 p., figs. The Newcomen Society, American branch, 1938. ISIS

IV. — BIOLOGICAL SCIENCES (Knowledge of organic nature)

27. — BIOLOGY (*generalities, " natural history "*)

Färber, Eduard. Vorgeschichte der Enzymologie. *Enzymologia* 3, XIII-XIV, 1937. ISIS

Howes, Paul Griswold. Handbook for the curious. XX+364 p. 329 fig. New York, PUTNAM, 1936 ($3.75). ISIS

This enigmatic title is applied to a natural history of animals brought by curious inquirers to the Bruce Museum of Natural History, Greenwich, Connecticut. It answers their questions and those of many others seeking information about the more obvious animals of the eastern half of the United States. C. A. K.

Luck, James Murray. Annual review of biochemistry. Volume VI., X+708 p. Stanford University, Calif., 1937 ($5). ISIS

Topical reviews fill a unique place in the history of science and in the resources and equipment of the investigator in that the literature of a subject is assembled, analysed, and correlated by a competent critic. As a system this method obviously lacks completeness in coverage of topics and, at times, in coverage of pertinent papers by the reviewers. It is quite certain, however, to include timely topics, to secure competent reviewers, and to record progress and shifts in the results of research. Such reviewing summaries thus become source books of the history of science of first importance.

The current volume of the *Annual review of biochemistry* well illustrates this function. It contains reviews of the literature in twenty-eight fields of or related to biochemistry, including such major fields as permeability; biological oxidations and reductions; enzymes, chemistry of carbohydrates, glycosides, lipins, steroids, proteins and amino acids, compounds of sulphur, nucleic acids, purines, and pyrimidines; the metabolism of the six last named and of carbohydrates and fats; hormones, vitamins; nutrition; biochemistry of muscle, and metabolism of brain and nerve with only brief reference to neurohumors. Certain minor fields usually related to other fields than biochemistry are included, such as microchemistry, detoxication mechanisms; the biochemistry of fish, chemical embryology, biochemistry of bacteria and immunochemistry. Reviews dealing with the biochemistry of plants

treat of plant pigments, alkaloids, photosynthesis, mineral nutrition, and organic acids of plants. The author index is for the first time supplemented by a subject index. C. A. K.

Meyer, Adolf. The tradition of ancient biology and medicine in the vitalistic periods of modern biology and medicine. *Bulletin of the institute of the history of medicine* 5, 800-21, 1937. ISIS

Schierbeek, A. Grote schrijvers als biologen. Een onbekende zijde van bekende mannen. 96 p. Den Haag, De Hofstad (received Dec. 1937) (in Dutch). ISIS

This is a series of studies of great writers from the point of view of the historian of biology : 1. ROUSSEAU; 2. BERNARDIN DE SAINT-PIERRE; 3. GŒTHE; 4. CHAMISSO. The author is well known already by his history of biology, From ARISTOTLE to PASTEUR (in Dutch, Amsterdam 1923; *Isis* 6, 211) and by many special studies in the same field (*Isis*, passim). G. S.

28. — BOTANY

(*Agronomy, phytopathology, palaeobotany*)

Brunn, Walter von. Das Maiglöckchen, eine alte, vielgerühmte Heilpflanze. 55 p., ill. Zum 50jährigen Bestehen der Firma DEGEN & KUTH, Düren-Rhld., 1937. ISIS

History of the lily-of-the-valley (Convallaria maialis) with a fine series of illustrations taken from the early herbals and many paintings. G. S.

Delatte, Armand. Herbarius, recherches sur le cérémonial usité chez les anciens pour la cueillette des simples et des plantes magiques. *Bulletin de l'Académie royale de Belgique* (classe des lettres) 22, 227-348, 1936. ISIS

Reviewed by CONWAY ZIRKLE, *Isis* 27, 531-32, 1937.

Erhardt-Siebold, Erika von. The heliotrope tradition. *Osiris* 3, 22-46, 10 fig., 1937. ISIS

Glidden, Harold W. The lemon in Asia and Europe. *Journal of the American oriental society* 57, 381-96, 1937. ISIS

Rousseau, Jacques. La botanique canadienne à l'époque de JACQUES CARTIER. *Annales de l'ACFAS* 3, 151-236, 1937. ISIS

See note under XVI-1-C.

Warner, Marjorie Fleming; Sherman, M. A.; Colvin, E. M. A bibliography of plant genetics. 552 p. Washington, U. S. Dept. of Agric. publication 164, 1934 (50 cents). ISIS

A bibliography of 10,156 items most of which are to be found in the U. S. D. A. library. An adequate subject and author index makes the material easily available. C. Z.

29. — ZOOLOGY

Gudger, E. W. Abnormal dentition in sharks, selachii. *Bulletin of the American museum of natural history* 73, 249-80, 21 fig., 1937. ISIS

Gudger, E. W. Bathytoshia, the giant stingaree of Australia. The largest of the sting-ray tribe in the Seven seas. *Australian museum magazine* 205-10, April-June 1937. ISIS

Gudger, E. W. Sargasso weed fish " nests " made by flying fishes not by sargasso fishes (antennariids) : a historical survey. *American naturalist* 71, 363-81, 8 fig., 1937. ISIS

Scott, William Berryman. A history of land mammals in the western hemisphere. XVII+786 p., ill. New York, MACMILLAN, 1937 ($7.50). ISIS

A completely rewritten and revised edition of a standard work which was first published in 1913, by the doyen of American palaeontology. M. F. A.-M.

V. — SCIENCES OF THE EARTH

(implying knowledge of both organic and inorganic nature)

31. — GEOGRAPHY AND OCEANOGRAPHY

Agostini, Enrico de. La reale società geografica italiana e la sua opera dall fondazione ad oggi (1867-1936). 153 p., 14 fig. Rome, Reale Società geografica italiana, 1937. ISIS

Anderson, Andrew Runni. ALEXANDER's Gate, Gog and Magog, and the inclosed nations. VIII+117 p. (Medieval Academy of America, publication no. 12, monograph no. 5). Cambridge, Mass., 1932. ISIS

Reviewed in *Geographical review* 23 350, 1933.

Banse, Ewald. Grosse Forschungsreisende. Ein Buch von Abenteurern, Entdeckern und Gelehrten. 284 p., 62 fig. München, LEHMANN, 1933. ISIS

Reviewed by KARL SAPPER, *DLZ* 4, 1807-09, 1933.

Bellón, Luis. Premiers travaux du Laboratoire océanographique des Canaries. *Revue générale des sciences* 42, 599, 1931. ISIS

Brett-James, Norman G. Maps of seventeenth-century London. (circ. 1603, 1660, 1702). 30 × 16 each. Author, Ridgeway House, Mill Hill School, N.W.7, 1929? ISIS

Buen, Rafael de. Lista cronológica de la campañas y navegaciones a las que se deben observaciones científicas de caracter oceanográfico. Memorias del Consejo Oceanográfico Ibero-Americano, no. 5, Madrid, 1930. ISIS

Bowman, Isaiah. Limits of land settlement. 380 p. New York, Council on Foreign Relations, 1937 ($3.50). ISIS

A timely report by ten specialists on settlement possibilities and population capacity in the principal frontier areas of the world. It includes an elaborate classified bibliography, and some seventy maps, many of which ware prepared especially for this study. No discussion of over-population, colonies and raw materials can afford to neglect this authoritative volume. Contents: Introduction by ISAIAH BOWMAN; 1. The prospect for redistribution of population, by CARL O. SAUER; 2. The food supply in the migration process, by CARL L. ALSBERG; 3. Canada as an area for settlement, by W. A. MACKINTOSH; 4. Population factors in Soviet Siberia, by BRUCE HOPPER; 5. The mainsprings of Asiatic migration, by OWEN LATTIMORE; 6. The present prospect of Chinese emigration, by CHEN HAN-SENG; 7. Japanese migration and colonization, by KARL J. PELZER; 8. Possibilities of settlement in Australia, by GRIFFITH TAYLOR; 9. Possibilities of settlement in Africa, by J. H. WELLINGTON; 10. Possibilities of settlement in South America, by ISAIAH BOWMAN. R. K. M.

Burpee, Lawrence Johnstone. The search for the Western sea. The story of the exploration of North-western America. New and revised edition. First edition, 1908. 2 vols. Toronto, MACMILLAN, 1935. ISIS

Catalogo ragionato delle carte esistenti nella cartoteca dell'Istituto geografico militare. Parte I. Carte relative a territori esteri. VX+678 p. Parte III. Globi, planiglobi, schizzi, carte varie. XII+215 p. Florence, 1932. ISIS

Reviewed in *Imago mundi* 2, 103, 1937.

Catalogus mapparum geographicarum ad historiam pertinentium, quae curante Collegio historico-geographorum adiuvantibus viris congressui ordinando in Polytechnico varsoviensi exponuntur. XV+296 p. Varsovie, 1933. ISIS

Reviewed by H. D., *Journal des savants* 94, 1935.

Close, Sir Charles Frederick. The map of England, or about England with an ordnance map. X+166 p., 8 ill. London, DAVIES, 1932. ISIS

Reviewed by O. G. S. C., *Antiquity* 6, 509, 1932; in *Nature* 131, 260, 1933.

Cowan, William (1851-1929). The maps of Edinburgh, 1544-1929. Second edition, revised with census of copies in Edinburgh libraries, by CHARLES B. BOOG WATSON. 136 p. Edinburgh, Public Libraries, 1932. ISIS

Darby, Henry Clifford. An historical geography of England before A.D. 1800: Fourteen studies. XII+566 p., maps. Cambridge University Press, 1936. ISIS

Reviewed in *Geographical review* 26, 696-98, 1936.

Du Bus, Charles. EDME-FRANÇOIS JOMARD et les origines du cabinet des cartes (1777-1862). 129 p. *Bulletin de la section de géographie*, 1931, Paris, 1932. ISIS

East, William Gordon. An historical geography of Europe. XX+480 p., 58 maps. London, METHUEN, 1935. ISIS

Reviewed in *Geographical review* 520, 1936. "'The historical geography of Europe' is its human geography at the successive stages of civilization through which it has passed, and its human geography in turn is the expression on the face of Europe of the efforts of human societies to mould and adapt the countryside to their use."

Elias, Edith L. Les explorations polaires (Pôle Nord, Pôle Sud). Traduction française de M. BEAUVAIS. Paris, PAYOT, 1930. ISIS

Hanke, Michael. Geschichte der amtlichen Kartographie Brandenburg-Preussens bis zum Ausgang der friderizianischen Zeit. Bearbeitet von HERMANN DEGNER. Mit einem Vorwort von ALBRECHT PENCK. 403 p., 1 map. (*Geograph. Abh.* 3. Reihe, H. 7). Stuttgart, ENGELHORN, 1935. ISIS

Reviewed by EUGEN OBERHUMMER, *DLZ* 58, 1665-68, 1937.

(Heawood, Edward). Reproductions of early engraved maps in the collection of the Royal Geographical Society. II. English county maps. With introduction and notes by EDWARD HEAWOOD. 14 p., 21 maps. London, Royal Geographical Society, 1932. ISIS

Henschel, Gerh. Literatur und Karten zur Geographie der Oberlausitz für die Zeit von 1560-1833. *Neues Laus. Mag.* 108, 114-46, 1932; 110, 82-122, 1934; 111, 185-223, 1935. ISIS

História da colonizacão portuguesa do Brasil. Edição monumental comemorativa do primeiro centenario da indipendência do Brasil. 3 vol.: CXXXII+276 p.; 458+LXIV p.; 396 p., pl., maps, ills. Pôrto, Litografia nacional, 1921-26. ISIS

Reviewed by ALDO MIELI, *Archeion* 18, 272-77, 1936.

Hobbs, William Herbert. The progress of discovery and exploration within the Arctic region. *Annals of the Association of American geographers* 27, 1-22, 4 maps, 1937. ISIS

Jervis, W. W. The world in maps: a study in map evolution. 208 p., 24 pl. London, PHILIP, 1936. ISIS

Reviewed in *Imago mundi* 2, 98, 1937, and by G. R. CRONE, *Geographical journal* 90, 85-6, 1937.

Kamal, Youssouf. Monumenta cartographica Africae et Egypti. Vol. 1, Epoque avant PTOLEMÉE, 107 fols., 1926. Vol. 2, PTOLEMÉE et époque gréco-romaine, pt. 1, 125 fols., 1928; pt. 2, 126 fols., 1932; pt. 3, 119 fols., 1932; pt. 4, Atlas antiquus et index, 130 fols., 1933. Vol. 3, Époque arabe, pt. 1, 101 fols., 1930; pt. 2, 109 fols., 1932. ISIS

Reviewed in *Geographical review* 24, 175, 1934.

Karpinski, Louis Charles. Historical atlas of the Great Lakes and Michigan. To accompany the Bibliography of the printed maps of Michigan. 104 p. Lansing, Michigan historical commission, 1931. ISIS

Reviewed in *Geographical review*, p. 165, 1933.

Lebel, Roland. Les voyageurs français du Maroc. L'exotisme marocain dans la littérature de voyage. 406 p. (Bibliothèque de culture et de vulgarisation nord-africaines). Paris, LAROSE, 1936. ISIS

Reviewed by PIERRE BRUNET, *Archeion* 18, 409, 1936 (received 1937).

Loeb, Edwin Meyer. Sumatra, its history and people. The archaeology and art of Sumatra, by ROBERT HEINE-GELDERN. IX+350 p., 40 pl. (Vol. 3 of *Wiener Beiträge zur Kulturgeschichte und Linguistik des Institutes für Völkerkunde der Universität Wien*). Wien, Institute für Völkerkunde der Universität, 1935. ISIS

Reviewed in *Nature* 136, 664, 1935.

Ludwig, Emil. The Nile : the life-story of a river : from the source to Egypt. Translated by MARY H. LINDSAY. 352 p., 34 pl. London, ALLEN, 1936. ISIS

Adverse criticism by H. E. HURST, *Nature* 139, 351, 1937.

Martineau, Alfred ; May, L. Ph. Tableau de l'expansion européenne à travers le monde de la fin du XII^e^ au début du XIX^e^ siècle. 369 p. Paris, Société de l'histoire des colonies françaises, 1935. ISIS

Reviewed by ALDO MIELI, *Archeion* 17, 319, 1935.

Mikkelsen, Ejnar. De østgrønlandske Eskimoers historie. 202 p., map., illus. Copenhagen, Gyldendalske Boghandel, Nordisk Forlag, 1934. ISIS

Reviewed by NELS A. BENGTSON, *Geographical review* 24, 695, 1934. History of the East Greenland Eskimos.

Miller, Francis Trevelyan. The fight to conquer the ends of the earth; BYRD's great adventure : with the complete story of all Polar explorations for one thousand years. Foreword by A. W. GREELY and HENRY FAIRFIELD OSBORN. 383 p., ills. Chicago, WINSTON, 1930. ISIS

Müller, Joh. Cristoph. Mappa geographica regni Bohemiae. XXV sectionibus exhibita. Regni Bohemiae... conspectus generalis... Gallice et bohemice praefatus est D. KUCHAŘ. 1 p. (French)+7 p., 26 tab. (Czech). Prague, 1934. ISIS

Reviewed in *Imago mundi* 1, 78, 1935.

Netzsch, Hermann. Deutsches topographisches Kartenwesen mit besonderer Berücksichtigung der bayerischen Verhältnisse. 30 p., 37 pl., 3 fig. München, Verlag d. Topogr. Büro, 1927. ISIS

Reviewed by ALBRECHT PENCK, *Deutsche Literaturzeitung* 1, 35-40, 1930.

Nisson, Claude. La conquête du Mont-Blanc. 215 p., fig. Paris, SPES, 1930. ISIS

Reviewed by B. M., *Revue générale des sciences*, 41, 482-83, 1930.

Olsen, Ørjan. De store opdagelser. 6 Bände in 8vo., insgesamt 1950 Seiten, mit einem Bildnis des Verfassers und zahlreichen Illustrationen. Oslo, Nasjonalforlaget, 1929-31 (in Norwegian). ISIS

Reviewed by WILLY HARTNER, *Isis* 27, 532-34, 1937.

Olsen, Ørjan. La conquête de la terre. Histoire des découvertes et des explorations des origines à nos jours. Vol. I, 280 p., II, 259 p., III, 271 p.; IV, 272 p. PAYOT, 1933-35. ISIS

Reviewed by PIERRE BRUNET, *Archeion* 16, 241-42, 1934; 17, 318-19, 1935.

Outhwaite, Leonard. Unrolling the map. The story of exploration. With drawings of ships by GORDON GRANT. XIV+351 p., 56 maps. London, CONSTABLE, 1935. ISIS

Reviewed in *Imago mundi* 2, 99, 1937.

Perreira, P. Ernesto. O Arquipélago dos Açores na história das ciências. *Petrus Nonius* 1, 61-79, 1937. ISIS

Philip, George. The story of the last hundred years. A geographical record, 1834-1934. 108 p., pl. London Geographical Institute, 1934. ISIS

Revelli, Paolo. Figurazioni cartografiche di Genova (1435-1935). 79 p., 24 pl., port. Comune di Genova, 1936. ISIS

Reviewed by ALDO MIELI, *Archeion* 18, 277-78, 1936.

Schütz, Julius Franz. Bausteine zu einer Bibliographie der Canarischen, Madeirischen und Capverdischen Inseln und der Azoren (bis einschl. 1920). IV+144 p. (Bücherkunde in Einzeldarstellungen, 2). Graz, MOSER, 1929. ISIS

Somerville, Vice-Admiral **Boyle.** The chart makers. London, BLACKWOOD, 1928. ISIS

Steffen, Hans. Beiträge zur Entdeckungs- und Erforschungsgeschichte der südamerikanischen Kordilleren. *Ibero-Ameriken. Arch.* 4, 173-233, 5 Kartenskizzen, 1930. ISIS

Sykes, Sir Percy Molesworth. A history of exploration. XIV+374 p., 25 ills., 33 maps. London, ROUTLEDGE, 2nd ed., 1936. ISIS

Reviewed by E. D. MACLAGAN, *Journal of the Royal Asiatic Society* 383-84, 1937.

Sykes, Sir Percy Molesworth. The quest for Cathay. XII+280 p., 17 pl., 9 maps. London, BLACK, 1936. ISIS

Reviewed in *Nature* 138, 1036, 1936.

Taylor, Griffith. Antarctic adventure and research. XI+245 p., maps, ills. (Appleton New World of science series). New York, APPLETON, 1930. ISIS

Reviewed by J. M. WORDIE, *Geographical review* 171-72, 1931.

Thomas, Thomas Barnaby. After CORONADO : Spanish exploration Northeast of New Mexico, 1696-1727. Documents from the archives of Spain, Mexico, and New Mexico. Translated and edited. With an historical introduction. XII+307 p. (The civilization of the American Indian). Norman, University of Oklahoma Press, 1935. ISIS

Reviewed by JOHN WALTON CAUGHEY, *American historical review* 41, 817, 1936.

(Warsaw). Catalogue de l'exposition des collections cartographiques de la Bibliothèque nationale à Varsovie. 113 p. Warsaw, 1934 (in Polish). ISIS

Reviewed in *Imago mundi* 1, 75, 1935.

(Warsaw). Catalogus mapparum geographicarum ad historiam pertinentium, quae curante collegio historico-geographorum adiuvantibus viris congressui ordinando in polytechnico Varsoviensi exponuntur. XV+296 p. Warsaw, 1933. ISIS

Reviewed in *Imago mundi* 1, 76, 1935.

Whitaker, Harold. The Yorkshire archaeological society record series. Vol. 86, for the year 1933. A descriptive list of the printed maps of Yorkshire and its ridings. 1577-1900. XIII+261 p., 23 pl. London, The Society, 1933. ISIS

Wickersham, James. A bibliography of Alaskan literature 1724-1924. Containing the titles of all histories, travels, voyages, newspapers,

periodicals, public documents, etc., relating to, descriptive of, or published in Russian America or Alaska, from 1724 to and including 1924. XXVII+635 p. (Alaska agricultural College and school of mines, miscellaneous publications, vol. I). Cordova, Cordova Daily Times Print, 1927. ISIS

Zechlin, Edmont. Das Problem der vorkolumbischen Entdeckung Amerikas und die Kolumbusforschung. Munich, *Historische Zeitschrift* 152, 1-47, 1935. ISIS

Reviewed by HERMAN RICHTER, *Lychnos* 2, 536-37, Uppsala 1937 (in Swedish).

32. — GEOLOGY, MINERALOGY, PALAEONTOLOGY, MINING

(*For palaeobotany, palaeozoology and palaeoanthropology, see respectively* 28. *botany*, 29. *zoology and* 39. *prehistory*)

Abbott, Mary. Jewels of romance and renown. 217 p. London, LAURIE, 1933. ISIS

Achiardi, Giovanni d'. I mineralogisti pisani dei tempi passati. 16 p. (Conferenza tenuta alla R. Scuola normale sup. di Pisa il 28 marzo 1931). Pisa, LISCHI, 1931. ISIS

Reviewed by ZAUNICK, *Mitteilungen z. Gesch. d. Med.*, 31, 275, 1932.

Andrée, Karl. Bernstein-Forschungen (Amber studies). H. 3. 241 p. Berlin, DE GRUYTER, 1933. ISIS

Antevs, Ernst. Late-glacial clay chronology of North America. Annual report of the Smithsonian institution for 1931, 313-24, 2 pl., 6 fig., Washington, 1932. ISIS

Bessmertny, Alexandre. L'Atlantide. Exposé des hypothèses relatives à l'énigme de l'Atlantide, traduction et avant-propos de F. GIDON. 270 p., 23 fig. Paris, PAYOT, 1935. ISIS

Reviewed by PIERRE BRUNET, *Archeion* 17, 469, 1935 (received April 1936).

Bessmertny, Alexander. Das Atlantisrätsel. Geschichte und Erklärung der Atlantishypothesen. 212 p., 29 fig., 8 pl. Leipzig, VOIGTLÄNDER, 1932. ISIS

Reviewed by ALDO MIELI, *Archeion* 15, 123, 1933.

Bornhardt, Wilhelm. Geschichte des Rammelsberger Bergbaues von seiner Aufnahme bis zur Neuzeit, auf Anregung und mit Unterstützung der Unterharzer Berg- und Hüttenwerke g.m.b.h. in Oker. 366 p., 11 pl. (Archiv für Lagerstättenforschung, H. 52.) Berlin, Preussische Geologische Landesanstalt, 1931. ISIS

Bramwell, James Guy. Lost Atlantis. 288 p. London, COBDEN-SANDERSON, 1937. ISIS

(British Museum). British Museum (Natural history). Special guide no. 8 : Guide to an exhibition illustrating the early history of palaeontology. 68 p., 4 pl. London, British Museum, 1931. ISIS

Bubnoff, Serge von. Grundprobleme der Geologie ; eine Einführung in geologisches Denken. VIII+237 p. Berlin, BORNTRAEGER, 1931. ISIS

Reviewed in *Nature*, 129, 420, 1932.

Cissarz, Arnold ; Jones, William R. German-English geological terminology : an introduction to German and English terms used in geology, including mineralogy, petrology, mineral deposits, etc. XVII+250 p. London, MURBY, 1931. ISIS

Davies, George MacDonald. A French-English vocabulary in geology and physical geography. IX+140 p. London, MURBY, 1932. ISIS

Du Toit, Alexander Logie. Our wandering continents ; an hypothesis of continental drifting. London, OLIVER & BOYD, 1937. ISIS

Erdmannsdörffer, Otto Heinrich. Mineralogie einst und jetzt. 17 p. (Heidelberger Universitätsreden, 15). Heidelberg, WINTER, 1931. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Gesch. d. Med.* 31, 274, 1932.

Fairchild, Herman Le Roy. The Geological Society of America 1888-1930. A chapter in earth science history. XVII+232 p., 18 port. New York, Geological Society, 1932. ISIS

Flett, Sir **John Smith.** The first hundred years of the geological survey of Great Britain. 280 p., 13 pl. London, H. M. Stationery Office, 1937. ISIS

Reviewed by W. W. WATTS, *Nature* 140, 915-17, 1937.

Freyberg, Bruno von. Die geologische Erforschung Thüringens in älterer Zeit : ein Beitrag zur Geschichte der Geologie biz zum Jahre 1843. XI+160 p., 8 pl. Berlin, BORNTRÄGER, 1932. ISIS

Reviewed in *Nature* 131, 531, 1933.

Hallowes, Kenneth Knight. The poetry of geology. XII+61 p. London, MURBY, 1933. ISIS

Heck, Nicholas Hunter. Earthquakes. XI+222 p., maps, ills. Princeton University Press, 1936. ISIS

Reviewed by ERNEST A. HODGSON, *Geographical review* 27, 346-47, 1937.

Heilfurth, Gerhard. Das erzgebirgische Bergmannslied. Ein Aufriss seiner literarischen Geschichte. 142 p. Schwarzenberg/Erzgebirge, Glückauf-Verl., 1936. ISIS

Reviewed by WILHELM HEISKE, *DLZ* 58, 148-9, 1937.

Hodgson, Ernest A. Bibliography of seismology. p. 139-318. Publ. of the Dominion Observatory Ottawa, 10, no. 9-18, Ottawa, 1931/33. ISIS

Huffmann, Fritz Robert. Über die sächsische Berggerichtsbarkeit vom 15. Jahrhundert bis zu ihrem Ende. Ein Beitrag zur Geschichte der Sondergerichte. VIII+149 p. Weimar, BÖHLAUS, 1935. ISIS

Reviewed by PAUL REHME, *DLZ* 58, 1861-64, 1937.

Klinckowstroem, Carl Graf von. Die Weltgeltung des deutschen Bergmannes. *Dtsch. Erde* 4, 380-86, 3 fig., München, 1933. ISIS

Krämer, Wolfgang. Geschichte des Eisenwerkes zu St. Ingbert mit besonderer Berücksichtigung der Frühzeit. Ein Beitrag zur Geschichte der pfälzisch-saarländischen Eisenverhüttung nach archivalischen Quellen. 188 p., 44 fig. (*Veröff. d. Pfälz. Ges. z. Forderg. d. Wiss.* 22). Speyer, Pfälz. Ges. z. Förd. d. Wiss., 1933. ISIS

Leriche, Maurice. L'histoire de la géologie dans la région gallo-belge. *Revue de l'Université de Bruxelles* 34, 132-57, 1928-29. ISIS

Richardson, Holden Chester. Iron, prehistoric and ancient. *American journal of archaeology* 38, 555-83, 1934. ISIS

Reviewed by THOMAS T. READ, *Geographical review* 25, 510, 1935.

Rickard, Thomas Arthur. The early use of the metals. *Journal of the Institute of metals* 43, 297-339 (see also, ibid., 339-65), 1930. ISIS

Reviewed by Graf CARL VON KLINCKOWSTROEM, *Mitteilungen z. Gesch. d. Med.*, 31, 135, 1932.

Rüger, Ludwig. Die Geröllgneise von Obermittweida (Erzgebirge) und die Entwicklung der Lehre vom Metamorphismus. *Aus der Heimat* 44, 106-16, 5 fig., Stuttgart, 1931. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin* 31, 30, 1932.

Sapper, Karl. Vulkankunde. VIII+424 p. Stuttgart, ENGELHORN, 1927. ISIS

Reviewed by H. H. READ, *Geographical journal* 77, 185-86, 1931. "The volume concludes with a history of volcanological research from the earliest times. The accounts of the investigations since 1850 are particularly full and valuable." C. W. A.

Schiffner, Carl. Aus dem Leben alter Freiberger Bergstudenten. XV+375 p., figs., pl. Freiberg i. Sa., Mauckisch, 1935. ISIS

Reviewed by ZAUNICK, *Mitt. z. Gesch. d. Med., d. Naturw. u. d. Techn.* 36, 286, 1937.

Thwaites, Fredrik Turville. The development of the theory of multiple glaciation in North America. *Trans. Wisconsin Acad. Sc., Arts and letters* 23, 41-164, 1927. ISIS

Reviewed by ZAUNICK, *Mitteilungen zur Geschichte der Medizin* 31, 30, 1932.

Treptow, Emil. Deutsche Meisterwerke bergmännischer Kunst. IV+46 p., 42 fig. (*Deutsches Museum*, Abh. u. Ber. 1, H. 3). Berlin, VDI Verlag, 1929. ISIS

Whishaw, Mrs. Ellen Mary. Atlantis in Andalucia : a study of folk memory. 284 p. London, RIDER, 1929. ISIS

Whitlock, Herbert Percy. The story of the gems : a popular handbook. VI+206 p., 34 pl. New York, FURMAN, 1936. ISIS

Reviewed by B. W. A., *Nature* 140, 703, 1937.

Williams, Alpheus Fuller. The genesis of the diamond. Vol. 1. XV+352+VI p., 89 pl.; vol. 2, XII+IV, 132 pl. London, BENN, 1932. ISIS

Reviewed by A. E. H. TUTTON, *Nature* 131, 255-57, 1933.

Wraný, Adalbert. Die Pflege der Mineralogie in Böhmen. Ein Beitrag zur vaterländischen Geschichte der Wissenschaften. VIII+421 p. Prag, Dominicus, 1896. ISIS

33. — METEOROLOGY, CLIMATOLOGY, AND TERRESTRIAL PHYSICS

Easton, C. Les hivers dans l'Europe occidentale : étude statistique et historique sur leur température, discussion des observations thermométriques 1852-1916 et 1757-1851, tableaux comparatifs, classifications des hivers 1205-1916, notices historiques sur les hivers remarquables, bibliographie. IV+210 p. Leyde, BRILL, 1928. ISIS

Reviewed by C. E. P. B., *Nature* 122, 917-18, 1928.

Hobbs, William Herbert. Some curious early accounts of the Greenland foehn. *Bulletin of the American meteorological society* 79-81, April 1928. ISIS

(Köppen, Vladimir). A meteorological cross section : the KÖPPEN birthday volumes. *Geographical review* 23, 472-78, 1933. ISIS

Ramos da Costa, A. Um capítulo da história da meteorologia. Desde os fins do século passado até hoje. *Petrus Nonius* 1, 52-60, 1937. ISIS

Rouch, Jules. Coup d'œil sur l'histoire de la météorologie. *Rev. scientif.* 69, 530-33, 1931. ISIS

Steiner, L. Die meteorologischen Beobachtungen und Forschungen in Ungarn. *Bulletin of the international committee of historical sciences*, 5, no. 19 (Seventh international congress of historical sciences, Warsaw, 1933), 312-18, 1933. ISIS

Störmer, Carl. Über die Probleme des Polarlichtes. Diagrs. ill. (*Ergebnisse der kosmischen Physik* 1, 1-86). Leipzig, Akademische Verlagsgesellschaft, 1931. ISIS

Reviewed by H. D. HARRADON, *Geographical Review* 22, 344-45, 1932.

Taylor, E. G. R. The early literature of natural calamities in Britain : with a bibliography. *The Scottish Geog. Mag.* 48, 83-89, 1932. ISIS

VI. — ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(Knowledge of man, past and present)

34. — ANATOMY

Fulton, J. F. A note on FRANCESCO GENNARI and the early history of cytoarchitectural studies of the cerebral cortex. *Bulletin of the institute of the history of medicine* 5, 895-913, 5 fig., 1937. ISIS

Young, Hugh Hampton. Genital abnormalities, hermaphroditism, and related adrenal diseases. XLI+649 p., ill. Baltimore, WILLIAMS & WILKINS, 1937. ($10). ISIS

This magnificent volume by one of the world's leading urologists will at once assume its rightful place as the foremost work on the subject with which it deals. Never before has there been a work on this subject, or rather, subjects, as thorough as this or as original, for the book is for the most part made up of reports and analyses, of the author's own cases. His unique operative procedures border on the marvellous, and his obvious sympathy for his patient's often sad lot adds an interest to his writing which renders what he has to say unusually attractive. The 534 drawings by WILLIAM P. DIDUSCH are beautiful and extraordinarily clear.

Professor YOUNG deals with every possible aspect of his subject in a manner both original and illuminating; his book is bound to become classic. Readers of *Isis* will be interested in the excellent first chapter which is devoted to a consideration of Hermaphroditism in literature and art.

There can be nothing but praise for the author's magnificent contribution and for the publishers who have made it available in so excellent a format.

M. F. A.-M.

35. — PHYSICAL ANTHROPOLOGY

(*Anthropometry and races of man*)

Ashley-Montagu, M. F. Infertility of the unmarried in primitive societies. *Oceania* 8, 15-26, 1937. ISIS

Barzun, Jacques. Race, a study in modern superstition. X+353 p. New York, HARCOURT, 1937 ($2.50). ISIS

Race is a word which from the scientific standpoint is utterly meaningless. Yet what it is by the world understood to mean invests that term with a power, a quality, perhaps not possessed by any other term in the languages

spoken by men. T. N. T. is a term around which far more attenuated emotions cycle in the ordinary mortal's breast; but " race ", about that term there are all the odours of garlic, and gesticulating creatures, people with number six noses and greasy skins, mentally and culturally inferior beings, savages, outsiders, aliens, dagoes, gypsies, bounders, brutes, brunettes for the fair, and blacks for the brunettes. About that term there eddy the waves of oceans of blood which have been spilled in its name, at this very moment countless numbers of human beings are being made to suffer deeply for the sin of not belonging to the " race " which some tyrant for his purposes has for the time being created. The slogan is *Nothing that is alien is human to me*. Well may TERENCE turn in his grave !

In the present volume Dr. BARZUN approaches the anatomisation of the modern form of an old superstition through an analysis of its functioning in French culture. He has done his work admirably, and his rehabilitation of GOBINEAU is something to be grateful for. This witty wise book deserves to be read widely. M. F. A.-M.

Lips, Julius. The savage hits back. XXXI+254 p., ill. Yale University Press, 1937 ($5). ISIS

The savage hits back would make an excellent title for a book in which the " savage " were allowed to give an unedited account of his views of the white man and of his civilization. There is a fair amount of such material available and more could easily be gathered. Professor LIPS gives two or three examples of such " savage " commentary, but no more; for the rest his book is devoted to a description of the 200 or so reproduced native carvings, engravings, objets d'art, etc., which in one way or another are supposed to represent the native commentary upon the white man. Professor LIPS' description of these things are frequently forced, as when he reads into the amazingly well executed naturalistic Chinese representations of white men motives and feelings which can at best be but guesses. Professor LIPS, in a very interesting preface, in which he details his unhappy experiences in Nazi Germany condemns the racialism of HITLER and his supporters, yet his own book places an altogether unnecessary emphasis upon racial distinctions. We find in this book an excellent illustration of what JACQUES BARZUN has recently said in this connection. " Nothing is more common among the racialists of all nations than to repudiate all beliefs in race-theories and follow up the disclaimer with judgments and assertions that are sheer racialism." (Race, N. Y., 1937, p. 100-1.)

Were the *content* of the book up to the level of the *format* this would be a good book. As it is, the book represents a series of descriptions of very interesting photographs of native renderings of white people, and as such it is, indeed, a most interesting " colect " M. F. A.-M.

36. — PHYSIOLOGY (*human and comparative*)

Kurzrok, Raphael. The endocrines in obstetrics and gynecology. XVI+488 p. WILLIAMS & WILKINS, 1937 ($7.50). ISIS

This valuable book brings together the very latest results, including many of the author's own findings and observations, concerning the endocrine

relations of the body with especial reference to their gynecological and obstetrical aspects. The book is distinguished by an opening chapter of some ten pages which is devoted to an account of the historical development of the subject. M. F. A.-M.

Malisoff, William Marias. The span of life. 339 p. LIPPINCOTT, 1937 ($2.50). ISIS

One of those age old fallacies which has it that " man is only as old as his arteries " yet still enshrines a partial truth. Dr. MALISOFF here makes much of this partial truth in a book very obviously, almost painfully so, written for popular consumption. There is so much in this book with which the reviewer disagrees, and there is so much which is demonstrably inaccurate or untrue, and yet there is so much which is stimulating and interesting, that those readers who are likely to go to the book through this notice may well be left to make their own tour of the book, which is really very informative, without further sign-posts being handed out here. M. F. A.-M.

39. — PREHISTORY

Artelt, Walter. Vorgeschichtlicher Zahnersatz auf deutschem Boden? *Zahnärztliche Mitteilungen* 28, 3 p., 1937. ISIS

Brunn, Walter v. Krankheitsbeobachtungen an Schädeln aus der jüngeren Steinzeit. *Mitteldeutsche Volkheit* 22-3, 1937. ISIS

Macalister, R. A. S. Ancient Ireland. XII+307 p., 24 pl. London, METHUEN, 1935. ISIS

Reviewed by W. F. GRIMES, *Antiquity* 11, 494-95, 1937.

MacCurdy, George Grant. Early man. 362 p. LIPPINCOTT, 1937 ($5). ISIS

This valuable volume comprises the thirty-six papers that were read by the distinguished authorities who were gathered together at The international symposium on early man at the academy of natural sciences Philadelphia, March 17-20, 1937. The symposium was appropriately timed to celebrate the 125th anniversary of the founding of the Philadelphia Academy. For those who were present at the symposium the book will be the memento of a very happy occasion, when knowledge, wit (alas, where is Dr. HOOTON's paper?), and champagne, flowed abundantly. For those who were unable to be present the book will be a happy surprise, for it is one of the most delightful, and needless to say, one of the most informative, collections of its kind. The whole field of the evidence relating to early man is surveyed, there is in these pages a great deal of material which is altogether unobtainable elsewhere. The book is well illustrated, and though there should have been an index, there isn't, and we can't complain. M. F. A.-M.

40. — ETHNOLOGY (*primitive and popular science*)

Childe, V. Gordon. Man makes himself. XII+275 p. London, WATTS, 1936. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 27, 534-36, 1937.

Eliade, Mircea. Folklorul ca instrument de cunoaştere. *Revista fundaţiilor regale* Nr. 4, 16 p. Bucharest, 1937. ISIS

Pelseneer, Jean. Questionnaire de folklore pour servir à l'histoire de la pensée scientifique. (*XVI^e Congrès international d'anthropologie et d'archéologie préhistorique*, Bruxelles, 1-8 septembre 1935, 993-97, 1936). *Le folklore brabançon* 16, 269-72, 1936. ISIS

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY

Seligman, Edwin R. A.; Johnson, Alvin. Encyclopaedia of the social sciences. 8 volumes. New York, MACMILLAN, 1937 ($45). ISIS

The original fifteen volumes of *The encyclopaedia of the social sciences* were published between 1930 and 1935, a truly monumental achievement of international scholarship covering every aspect of the social sciences. In the present edition the fifteen volumes are made available in an eight volume set very serviceably bound in dark blue buckram and at a third of the original price. This brings this invaluable work within the range of the purchasing power of the scholar, and every scholar should have this work in his library. The work will be of particular interest and value to the historian of science, for in these volumes is to be found information on men and matters which can only, in many cases, be obtained elsewhere at the price of a great expenditure of energy. Apart from its obvious value as a work of reference compiled and written by the greatest authorities in their respective fields, the work makes excellent occasional reading. It cannot be too highly recommended. M. F. A.-M.

44. — HISTORY OF CIVILIZATION

(*general history, historical methods, biography and chronology*)

Castillejo, José. Wars of ideas in Spain, philosophy, politics and education. With an introduction by Sir MICHAEL SADLER. X+168 p. London, MURRAY, 1937 (6s.). ISIS

A timely little book which helps us to understand the chaotic conditions of Spain, " the country of saints, rebels and artists." Except for the mediaeval, and especially the Moorish part which is weak, this is an excellent

synthesis. I took special interest in the description of modern events, say, after the destruction of all foreign books ordered in 1824. A great personality emerges, that is, FRANCISCO GINER DE LOS RIOS, who was an educator of genius. The work of the " Junta para ampliación de estudios e investigaciones cientificas " is well described, the author having been its permanent secretary since its inception in 1907. G. S.

(History). List of doctoral dissertations in history now in progress at American universities, December 1937, 70 p. Washington, D.C., Division of historical research Carnegie Institution, 1938. ISIS

Raglan, Lord. The hero, a study in tradition, myth, and drama. XI+311 p. New York, Oxford University Press, 1937 ($3.50). ISIS

Lord RAGLAN has written a real broadside, full of the whiskey of life softened by the soda of experience; in other words, good seventeenth century stuff with the addition of twentieth century erudition. " Light reading for highbrows " the dust-jacket tells us; but highbrows or no brows, the book is one which must be read by all who are in any way concerned with the meaning and nature of evidence and what passes for history. Lord RAGLAN is a social anthropologist, and it is as such that he attacks the subjects of tradition, myth, and drama. His indictment of what historians and others take for history and evidence is brilliant, and he lays about him with telling effect; his speed is intoxicating. Lord RAGLAN has not altogether escaped the intoxicating effect of his own vigorous onslaught, for sometimes, it at any rate seems to us, that he goes a little too far and lays out the innocent as well as the guilty, as when he says that " There is no Englishman who can trace his family to the time of the conquest by any evidence which would be admitted in a court of law " (p. 18-19). I think I can give Lord RAGLAN such evidence for at least two English families, one is the family of FRANCIS GALTON whose pedigree no less a person than KARL PEARSON is responsible for; and another is the family of the TYSONS whose pedigree I have myself traced to the Battle of Hastings and the Norman Conquest, and for a good many years before that. But this is perhaps a minor point. It is quite true, as Lord RAGLAN says, that on the whole very few pedigrees and coats of arms are really worth much, and as for legitimate descendents those who know their Stuart monarchs, for example, will have no doubts upon that score! As for traditional narrative and historical fact, myth and its relation to history, the relation appears to be that there is no relation. M. F. A.-M.

Robinson, James Harvey. The human comedy. As devised and directed by mankind itself. With an introduction by HARRY ELMER BARNES. XVII+394 p. New York, HARPER, 1937. ISIS

Reviewed by LYNN THORNDIKE, *Journal of modern history* 9, 367-69, 1937.

48. — HISTORY OF PHILOSOPHY

(*See also above* 18. *Philosophy of science*)

C..nen, **Jacques J.** Philosophical essays. XIII+176 p. London, BALE, Sons & CURNOW, 1937 (5/-). ISIS

" Philosophy, in its scientific presentation as metaphysics, aims chiefly at counteracting the abstract character which the different sciences must have, this owing to our necessary study and treatment of them each independently of all the others. So, the collocation of all the sciences under one head, which is the philosopher's personal theory, is a philosophic attempt at defining and systematising human experience, and which is what is generally meant by philosophy. Hence advances in philosophic enquiry are as much initiative of scientific progress as they are the outcome of it." Contents : Psycho-physical origins; Spatial nothingness; The origin of space; Moral facts and origins; Psycho-physical relationship; Morality and moral ideals; The economic solution; Principles of psychotherapy; Index.

Pratt, James Bissett. Personal realism. XI+387 p. New York, MACMILLAN, 1937 ($3). ISIS

A presentation of the theory of knowledge christened " critical realism " and of the interaction of mind and body. The first third of the volume treats of the fundamental issues of substance, existence, truth, and knowledge. The world of experience is related to the phenomena of communication and causation. The various hypotheses of realism are analyzed and defined and their decline traced in the nineteenth century, when they were replaced by Berkeleyan, Kantian, and neo-Kantian idealism. The rise of the new realistic interpretations is outlined, the relation of body and spirit and the problem of survival are discussed, and the essential impossibility of a science of man is presented since psychology cannot explain and predict with the exactness and certainty of the other sciences. " Neither associationism nor behaviorism deals with human experience as it really is." C. A. K.

Valéry, Paul. Variété II. 1 vol. Paris, GALLIMARD, 1930. ISIS

Les deux premiers chapitres : " Fragment d'un DESCARTES " et " Le retour de Hollande", contiennent des réflexions sur DESCARTES et MERSENNE. Dans le chapitre intitulé : " Passage de VERLAINE", on trouvera un portrait de HENRI POINCARÉ.

VII. — MEDICINE

50. — HISTORY, ORGANIZATION, AND PHILOSOPHY OF MEDICINE

Castiglioni, Arturo. Storia della medicina. XXXII+825 p. Milan, MONDADORI, 1936. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 27, 536-38, 1937.

Diepgen, Paul. Der Alkohol in der Medizingeschichte. Jahrbuch 1937 der Gesellschaft für die Geschichte und Bibliographie des Brauwesens E. V., p. 7-30. ISIS

Diepgen, Paul. Wirtschaftsgeschichte und Medizingeschichte. *Deutsche medizinische Wochenschrift* Nr. 45, 1705, 1937. ISIS

Flexner, James Thomas. Doctors on horseback. XIV+370 p. New York, Viking Press, 1937. ($2.75). ISIS

Mr. FLEXNER has written a book about six pioneers of American medicine which, we believe, will never be surpassed. It is written with just that proper admixture of charm, wit, sympathy, scholarship and exactness, calculated to make the perfect book of its class. Mr. FLEXNER's judgment is always sound, his respect for facts that of the scientist, his heart in the right place, and his writing efficient and delightful. The book is, in short, the best piece of popular writing that we remember to have seen for many years, and that is saying a great deal. This is Mr. FLEXNER's first book, and he is heartily to be congratulated upon it. We look forward with much pleasure to noticing his future books, and we hope that there will be many, in the pages of this journal. The six pioneers of Mr. FLEXNER's book are JOHN MORGAN (1735-1789), BENJAMIN RUSH (1745-1813), EPHRAIM MCDOWELL (1771-1830), DANIEL DRAKE (1785-1852), WILLIAM BEAUMONT (1785-1853), CRAWFORD W. LONG (1815-1878) and WILLIAM T. G. MORTON (1819-1868). The book is well illustrated, there are excellent selected bibliographies, and a good index. The format of the book is very pleasing and up to the usual standard of excellence maintained by the Viking Press. M. F .A.-M.

Jones, Harold Wellington. A portrait gallery of physicians. The collection in the Army medical library. *Annals of medical history* 9, 517-32, 25 fig., 1937. ISIS

Portraits of 25 physicians with brief biographies. M. C. W.

Lefanu, W. R. British periodicals of medicine. A chronological list *Bulletin of the Institute of the history of medicine* 5, 735-61, 827-46, 1937. ISIS

Leite, Serafim. Os Jesuítas no Brasil e a medicina. *Petrus Nonius* 1, 1-12, 1937. ISIS

Marshall, Madelene. A history of dental libraries in the United States. With sketches of important dental libraries in Canada and foreign countries. *Bulletin of the medical library association* 26, 86-99, 1937. ISIS

Miller, Joseph L. Cesarean section in Virginia in the preaseptic era, 1794-1879. *Annals of medical history* 10, 23-35, 4 fig., 1938. ISIS

Rosen, George. On the historical investigation of occupational diseases. An aperçu. *Bulletin of the institute of the history of medicine* 5, 941-46, 1937. ISIS

Shryock, Richard. H The development of modern medicine : an interpretation of the social and scientific factors involved. XV+ 442 p., frontispiece, 7 illus. Philadelphia, University of Pennsylvania Press, 1936. ISIS

Reviewed by C. D. LEAKE, *Isis* 27, 538-39, 1937.

Shryock, Richard H. The historian looks at medicine. *Bulletin of the institute of the history of medicine* 5, 887-94, 1937. ISIS

Trout, Hugh H. The " Scotch-Irish " of the Valley of Virginia and their influence on the medical progress in America. *Annals of medical history* 10, 71-82, 9 fig., 1938 (to be concluded). ISIS

Weinberger, Bernhard Wolf. The origin of organized dentistry. With particular reference to the part played by the dental profession in New York. *Bulletin of the dental society of the state of New York* 5, 40 p., 1937. ISIS

51. — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES. PUBLIC HEALTH AND SOCIAL MEDICINE

Arnold, Hermann. Zur Frühgeschichte der chronischen Wirbelsäulenversteifung. *Klinische Wochenschrift* 16, 1286-88, 2 fig., 1937. ISIS

Tucker, Beverley R. Development of psychiatry and neurology in Virginia. *Annals of medical history* 10, 91-7, 2 fig., 1938. ISIS

52. — HISTORY OF HOSPITALS, OF MEDICAL TEACHING, AND OF THE MEDICAL PROFESSION. BALNEOLOGY, MEDICAL GEOGRAPHY

Brockbank, Edward Mansfield. A short history of Cheadle Royal from its foundation in 1766 for the humane treatment of mental disease. IX+76 p. Manchester, SHERRATT & HUGHES, 1934. ISIS

Brockband, Edward Mansfield. A centenary history of the Manchester medical society. 101 p. Manchester, SHERRATT & HUGHES, 1934. ISIS

From the Publick Infirmary of 1752 and from the still existant literary and philosophical society begun in 1781 came two of Manchester's later medical institutions. Under the above titles they are charmingly written of by Dr. BROCKBANK, honorary consulting physician at the Royal infirmary and also chairman of the library committee of the medical society.

The Infirmary was parent to the Lunatic hospital established in 1766. With the city's growth, the mentally sick were treated, after 1850, at Cheadle in rural Cheshire in a newly built institution. The author skillfully parades the changing lunacy laws, changing ideas of causation and ways of treatment. JOHN FERRIER's methods, for instance, are fully given and they had in 1806 won the approval of PINEL particularly in their relation to lessening of mechanical restraint. Biographies of Cheadles' superintendants with portraits, include HENRY MAUDSLEY (1835-1908), G. W. MOULD (1835-1919), WALTER SCOWCROFT (1854-1924).

The second of the above items begins by mentioning the large scientific and medical interests of the literary and philosophical society. About half of its founders were doctors, in its quarters lectures on physiology and anatomy were given to medical students, while its second president, Dr. THOMAS PERCIVAL (1740-1804) of medical ethics fame, served for 28 years. Nevertheless, a medical society with small library and reading room was separately set up in 1834.

Its organizational difficulties, the acrimony with publicity of its early professional disputes, its charges of plagiarism, give contrast to the story of achievement by many of its brilliant members. After considerable moving about, the library—destined to become the Society's great treasure—was in 1872 affiliated with the Royal school of medicine associated with Owens College the latter became the University of Manchester in 1904.

Among the library's 75,000 volumes are many varities, the oldest being an Italian version of GUY DE CHAULIAC's Chirurgia Magna, Venice, 1480. Included also is FRANÇOIS ROUSSET's *Traite nouveau de l'hysterotomotokie ou enfantement caesarien*, Paris, 1581. BROCKBANK notes this as the first use of the word Caesarien with surgical connotation.

In the biographical section the author desires to do tardy justice to the Society's first president, JOHN HULL (1761-1843) and to the " born book collector " THOMAS WINDSOR (1831-1910) whose portraits are shown. The former was an obstetrician and botanist, who in 1800 was the first to use the term phlegmasia dolens, a term later accepted by his better known surgical fellow-townsman, CHAS. WHITE (1728-1813). That the most valuable collection of medical literature in Britain, outside of London, is in Manchester results from the effort and liberal gifts of THOMAS WINDSOR. He was an opthalmological surgeon with splendid literary predelections, a bachelor of independant means, fearful that his beloved gifts would not be appreciated. His vast knowledge and love of medical literature together with his skill in bargaining was at the service of the society as honorary librarian for the 25 years ending in 1883. As purchasing agent for the United States surgeon general's library he became friendly with JOHN

BILLINGS whom he visited at Washington in 1882. Certain of his books were left to the latter library in his highly eccentric will. The two secretaries, JOHN WALKER (1803-1847) and JOS. PEEL CATLOW (?-1861), who in 1834-35 battled successfully for organization are briefly treated. H. H.

Hume, Edgar Erskine. The oldest hospital in America. The hospital of Jesus of Nazareth in the city of Mexico, established in 1524, it is still in use. *Medical life* 44, 317-30, illus., 1937. ISIS

Renaud, Frank. A short history of the House of recovery of Fewer hospital in Manchester. 35 p. Manchester, TAYLOR, GARNETT, EVANS, 1885. ISIS

Disease spread through overcrowding in industrial cities is faced first in Manchester. The isolation hospital founded there in 1796 is historically followed up to 1885. The story is not very well told, slighting the glorious founding by a group of good citizens, THOMAS PERICIVAL among them. Amalgamation with the Royal infirmary occurs in 1852. Some 20 years later it is set up in the suburbs under the name of the Barnes house of recovery. H. H.

Warthen, Harry J. Medicine and Shockoe Hill. *Annals of medical history* 10, 83-90, 5 fig., 1938. ISIS

VIII. — EDUCATION (the methods of accumulating, imparting and diffusing knowledge)

54. — EDUCATION (*generalities, methods, colleges, universities*)

(Liége). Liber memorialis. L'Université de Liége de 1867 à 1935. Notices biographiques publiées par les soins de LÉON HALKIN, avec une introduction par PAUL HARSIN. Tome I : Faculté de philosophie et lettres. Faculté de droit. Tome II : Faculté des sciences, écoles spéciales. Faculté technique. Tome III : Faculté de médecine. 3 vol. Liége, 1936. ISIS

Walton, C. E. An historical prospect of Harvard College 1636-1936. 48 p., 8 pl. (Harvard University archives tercentenary exhibition). Society for the preservation of New England antiquities, 1936. ISIS

55. — ACADEMIES, SOCIETIES, CONGRESSES. NATIONAL AND INTERNATIONAL ORGANIZATION OF SCIENCE

(Societies and congresses devoted to particular sciences are classified under those sciences. For the internal organization of science—ISIS I, 195—*see section* 17)

Almhult, Arthur ; Holmberg, Arne ; Schück, Adolf. Academies in Sweden. *Baltic and Scandinavian countries* 3, 305-19, 1937. ISIS

The oldest Swedish academy was founded in 1739, the youngest in 1932.

Brunn, Walter v. Zum 250jährigen Bestehen der Kaiserlich Leopoldinisch-Carolinisch Deutschen Akademie der Naturforscher. *Forschungen und Fortschritte* 13, 179, 1937. ISIS

57. — MUSEOLOGY (*Museum and collections*)

Adams, Charles C. A chronological sketch of the history of the New York State Museum. By members of the staff. Introductory note by CHARLES C. ADAMS. *New York state museum bulletin* no. 313, 85-88, 1937. ISIS

58. — CATALOGUES OF SECOND-HAND BOOKS ON THE HISTORY AND PHILOSOPHY OF SCIENCE

Many catalogues of second-hand books are so interesting and so full of valuable information that we shall henceforth register them in this section, together with other lists of a similar nature, such as catalogues of scientific medals and prints. When applying to the publishers of these catalogues for a copy, please mention *Isis*.

Argosy Bookstores. Maps of America : 1. United States, 2. British America, 3. Latin America. Catalogue 115. 46 p. New York, 114 E. 59th St. (received Jan. 1938). ISIS

Art Ancien. Bibliotheca medica. A collection of 900 medical books, prints, and broadsides of the 15-19th centuries, many recently removed from great public and private libraries including numerous first editions of famous physicians from HIPPOCRATES to FREUD. Catalogue 21, 204 p. Zurich 1, 8 Pelikanstrasse (received Jan. 1938). ISIS

Brick Row Book Shop. DANTE ALIGHIERI, books by him or relating to him. Special author list no. 2, 23 p., 168 items. New York, 55 Fifth Ave. (received Jan. 1938). ISIS

Brick Row Book Shop. A list of dictionaries in various languages, compiled by E. BYRNE HACKETT. Special list no. 3, 358 p., 369 items. New York City, 55 Fifth Ave. 1937. ISIS

Davis & Orioli. Rare books, including three superb books printed on vellum. No. 79, 45 p., 189 items. London, W.C.1, 37 Museum St. (received Nov. 1937). ISIS

Durtal. Catalogue 21, 1re partie : livres anciens rares ou curieux, littérature, histoire, voyages, etc. 2e partie : livres et documents rares pour servir à l'histoire des sciences. 57 p., 623 items. Paris, 13 rue Jacob, 1937. ISIS

Fock, Gustav. Allgemeine und angewandte Zoologie. Enthält ein Angebot von Zeitschriften, Büchern und Monographien zum Teil aus dem Besitz des G. GRIMPE und L. PLATE des in den Ruhestand getretenen L. PLATE. No. 715, 160 p., 3988 items. Leipzig C 1, Sternwartenstr. 8, (received Nov. 1937). ISIS

Fock, Gustav. Astronomie, Astrophysik, Geodäsie. Antiquariatskatalog Nr. 717, 129 p., 2792 items. Leipzig C 1, Sternwartenstr. 8 (received Feb. 1938). ISIS

Gilhofer, H.; Ranschburg, H. Bibliothek Graf SPRINZENSTEIN. Darunter : Wertvolle Pergament-Manuskripte des 13. und 14. Jahrhunderts. Inkunabeln. Deutsche Holzschnittbücher des 16. Jahrhunderts. Interessante Einbände, dabei gotische Lederschnittbände. Alte Medizin und Naturwissenschaften. Geographie, Americana, Reisen. Rechts- und Staatswissenschaften. Kupferstichwerke. Jagd- und Pferdebücher, etc. Auktion XXI. 28 p., 205 items, 4 pl. Luzern, 6 Alpenstr., 1937. ISIS

Goldschmidt, E. P. Old science and medicine. List 27, 37 p., 301 items. London W.1, 45, Old Bond St. (received Jan. 1938). ISIS

Goldschmidt, E. P. Rare and valuable books. Catalogue 46. 72 p., 138 items. London, 45, Old Bond St. (received Jan. 1938). ISIS

Grafton & Co. Science and technology. No. 193. 52 p., 1027 items. London, W.C.1, 51 Great Russell St. (received Nov. 1937). ISIS

Heffer, W. A catalogue of books, anthropology, ethnology and related subjects including the collection of a professor of social anthropology. Catalogue 521, 42 p., 750 items. Cambridge, 3-4 Petty Cury, 1938. ISIS

Hoosier Bookshop. Americana. Also first editions, medicine, miscellaneous. List 57, 222 items. Indianapolis, 2242 Park Ave. (received Nov. 1937). ISIS

Hoosier Bookshop. Americana (Indiana history particularly), pt. I. Medicine (American items mostly), pt. 2. List 58, 181 items. Indianapolis, Indiana, 2242 Park Ave., (received January 1938). ISIS

International antiquariaat. Medical books, XVth-XIXth century together with a few books on physics. Catalogue no. 91, 49 p., 424 items. Amsterdam, Keizersgracht 610 (received Feb. 1938). ISIS

Koehler, Paul. Bibliotheca philosophica, psychologica, paedagogica et theologica, parts II. Nr. 75-6, 6332 items. Leipzig C 1, Scherlstrasse 10 (received Feb. 1938). ISIS

Lier, R. Old medicine and science. 146 items. Via S. Felice a Ema 33, Galluzzo (Firence, 1938). ISIS

Nijhoff, Martinus. Mathematics. Second-hand book department, list no. 209. 68 items. The Hague, 9 Lange Voorhout (received Jan. 1938). ISIS

Nourry, Emile. Médecine ancienne, anatomie-chirurgie, chimie et alchimie, sciences anciennes. No. 64, 92 p., 1061 items. Paris, 62 rue des Écoles, 1938. ISIS

Quaritch, Bernard. A catalogue of important books and periodicals on geology and palaeontology. No. 544, 39 p., 538 items. London, W.1, 11 Grafton St., New Bond. St., 1937. ISIS

Rosenthal, Ludwig. Interesting old books, manuscripts, incunabula, America, geography, natural sciences, medicine, astronomy, mathe-

matics, history, England, France, Holland, classics. Catalogue 186, 63 p., 378 items. Den Haag, 135 Willem de Zwijgerlaan, (received Dec. 1937). ISIS

Sotheran, Henry. Annotated catalogue of works on medicine, surgery and pharmacology, with sections on biology, and autograph letters and portraits of medical men and biologists. Medical series, no. 2, no. 852, 144 p. 2364 items. London, W.1, 2, 3, 4 and 5 Sackville St., 1938. ISIS

59. — MEMORIA TECHNICA

Critical bibliography no. 53. *Isis*, vol. 29, 204-292.

This note is published at the end of our bibliography solely for the convenience of the scholars who cut out the whole or part of it, attach extracts to catalogue cards and classify them. By adding this note to the others they will be able to find out rapidly whether this particular bibliography has been analyzed or not.

Isis no. 75 (vol. 27, 3, 192 p., 2 pl., 10 fig.). Bruges, 1937.

This no. is analyzed in the 53rd Critical bibliography. Every previous number has been analyzed in previous bibliographies. G. S.

60. — ERRATA

Si quis Argi oculos habere posset eosque omnes diligentissime ac accuratissime intenderet in singulos versus, multa tamen eum inter corrigendum effugerent. JOANNES MATTHAEUS (Wittenberg, 1619).

Isis

vol. 25, 401, l. 13, replace cubit by digit.

vol. 27, 600, add in the index WU, LIEN-TEH, XXV, 301 ; XXVII, 341-42.

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their set of *Isis* and the *Introduction*. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note to indicate that these and previous errata have been taken into account. G. S.

These and the previous errata have been corrected by.....

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The Arabic figures refer to the historical and to the systematic classification (Parts II and III) which are subdivided in sections numbered consecutively from 1 to 60. For instance, Bortolotti, E., 3 indicates that a paper by Bortolotti is listed in section 3 (Babylonia and Assyria); Abbott, M., 32 indicates that a paper by Abbott is listed in section 32 (Geology).

February 1938. FRANCES SIEGEL.

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Indianapolis meeting of HSS, 1937

Joint Session : *Section L, A.A.A.S. and the History of Science Society.*

A large group crowded into the hall of the Columbia Club, Indianapolis, on Thursday morning, December 30 th, where a joint meeting was held of Section L of the A.A.A.S. and the History of Science Society.

The meeting opened under the chairmanship of R. C. ARCHIBALD, Professor of Mathematics, Brown University, with a symposium on "Science and Society". Dr. H. E. SIGERIST, Professor of the History of Medicine, Johns Hopkins Medical School, gave a clear survey of the historical relations between science and society, pointing out the factors contributed by scientific effort to the development of cooperative enterprise. CHAUNCEY D. LEAKE, Professor of Pharmacology, University of California Medical School, discussed factors interfering with the free spread and development of science. These were traced to popular ignorance, fear and superstition. A vigorous discussion followed. Among the participants were Dr. GEORGE SARTON, Dr. SANFORD LARKEY, Dr. JOHN PELEY, WATSON DAVIS and Mrs. MARIAN LECHE. The discussion was continued at a special luncheon which was held at the Columbia Club. The session agreed to endorse the activities of the appropriate groups of the A.A.A.S. in attempting to get over to the public the intangible general attitude and spirit of science. It was recommended that efforts be made to introduce reading and presentation of the history of science early in elementary schools, through cooperation with progressive educational associations and book publishers.

Following the symposium, Dr. HUGH MILLER, Professor of Philosophy, University of California at Los Angeles, presented a detailed analysis of the inter-relations of science, history and philosophy. He emphasized particularly the necessity for recognizing the evolutionary factor in those scientific disciplines which have developed traditionally with the view point of the immutability of nature.

WATSON DAVIS, Director of Science Service, gave a fine demonstration of the Bibliofilm Service and displayed the new and improved reading devices.

The morning session concluded with a report by Dr. SANFORD V. LARKEY, Librarian of the Welch Medical Library, on the History of

Science Congress in Prague, August 1937. Major emphasis at the Congress was given the work of PURKINJE.

Following the luncheon, the session was resumed with a discussion by Dr. GEORGE SARTON, Editor of *Isis*, on the transmission of scientific literature by incunabula. Dr. SARTON emphasized the importance of wholesale manuscript copying and later printing in the critical appraisal of scholasticism and the development of modern science.

The title offered by GRANT MCCOLLEY of Smith College, was an error. Instead of Renaissance notions of "spiral nebulae" he discussed the ideas of COPERNICUS regarding an infinite universe and their subsequent influence. This paper was discussed by Dr. SANFORD LARKEY.

The symposium on the Maya Civilization was opened by Dr. A. S. PEARSE, Professor of Zoology, Duke University. Dr. PEARSE showed a series of beautifully colored pictures illustrating various phases of Maya culture. It was seen that the remarkable scientific achievements of these people were chiefly applied in superstitious ways. Dr. ELIZABETH STEWART, Fellow at the Johns Hopkins University, brilliantly presented an initial survey of Maya medicine. Like the early Egyptian medicine, this was largely a matter of empirical application of the gross effects of plant materials observed in the process of trial and error for food. It has survived through Spanish commentaries and is followed today. A general discussion followed.

The session was closed by a spirited analysis of the work of COURNOT by Dr. H. T. DAVIS, Professor of Mathematics, Northwestern University. COURNOT, a century ago, developed a coherent theory of wealth, based on the recognition of factors which are still in active operation.

CHAUNCEY D. LEAKE.

The History of Science Society

REPORT OF THE SECRETARY-TREASURER

To the President and Council :

I herewith take pleasure in presenting the fourteenth annual report of the Secretary and Treasurer of the Society.

A brief summary of the financial statement is as follows :

The total membership of the Society is aproximately 647, which total is divided in the following manner.

509 active members, including Patrons;
45 new members for 1937;
93 delinquent (Ten are new members who will pay Jan. 1st. Approximately 25 may have paid to Bruxelles office. Thirty will very likely pay Jan. 1st. The balance will be dropped shortly after the 1st.)
62 have died, resigned, or were dropped during 1937.

This leaves a balance of 461 paid members for 1937.

RECEIPTS FOR 1937

Dues for 1937	$ 2305.00
Osiris, Vols. 1 & 2	217.00
Patron contributions	290.00
Book Royalties	100.00
	$ 2912.00

EXPENDITURES

Isis, payments	$ 1844.00
Secretarial aid and hon.	580.00
Printing and stationery	40.00
Stamps, express, telegraph	72.50
Transportation	51.00
Bank charges	27.80
Am. Coun. Lear. Soc..	25.00
Miscel.	13.00
	$ 2653.30

(*Library of Congress*) F. E. BRASCH.

The Editor of Isis

HARVARD LIBRARY, 185,
CAMBRIDGE, MASS.

January 31, 1938.

Dear Sir,

The enclosed report is submitted as a matter of routine to the members of the council of the HSS, to the members of the editorial board of *Isis* and to a few other friends. It shows a loss of $190.41, which would have been greater still but that 312 less pages were published in 1937 than in the previous year. However, as a result there is a great accumulation of material, and I have decided to publish again 1200 pages next year. The *Osiris* account (which is not included) shows a gain of $26.31, this being due to the generous help of a friend, without which the loss would have been heavy, and to the fact that most of the overhead expenses were charged to *Isis* rather than *Osiris*. This was a natural procedure, not only because *Osiris* is a baby but also because it was created in order to relieve *Isis* from the longer memoirs, and thus increase *Isis*' own variety and attractiveness, a result which has been duly achieved.

Osiris is now well launched. The Library of Congress will devote special printed cards to each memoir published in it, and thus it will be possible for authors to obtain cards in quantity to attach to their reprints or for libraries to obtain complete sets of *Osiris* cards.

Sincerely yours,

GEORGE SARTON.

ISIS REPORT FOR 1937

This report covers nos. 72 to 75, that is, a total of 913 p., with 8 pl. 57 fig., including 42 memoirs, 31 shorter items, 74 reviews and 1485 bibliographic notes. For comparison, see Report for 1936 in *Isis* 27, 411.

SUMMARY OF ACCOUNTS

	EXPENDITURES			RECEIPTS	
1. Printing	$1,978.17		HSS		$1,844.00
2. Plates, fig.	152.96	$2,131.13	CI		950.00
Mailing		528.08	Sales, Bruges	693.75	
Royalties			» Brussels	34.72	
Reprints	241.52		» U. S.	15.90	744.37
Gifts	65.13	306.65			$3,538.37
Editorial					
Brussels office	285.38				
Cambridge »	277.79	563.17			
Indianapolis		100.00			
Advertising		99.75	Editor's loss		190.41
3.		$3,728.78			$3,728.78

The cost of printing (items 1 and 2) averaged $2.33; the total cost (item 3), $4.08 per illustrated page.

This account is only approximately exact, as I have not bothered about the fluctuation of the exchange.

Cambridge, Mass., Jan. 27, 1938.

When proposing a candidate for election, this form may be filled in and sent to the Secretary,

Dr. HENRY R. VIETS

Boston Medical Library, 8, Fenway, Boston, Mass.

Certificate of Recommendation to be typewritten or legibly written.

HISTORY OF SCIENCE SOCIETY

CERTIFICATE OF RECOMMENDATION

being desirous of becoming a Member of the History of Science Society, we, whose names are hereunto subscribed, being Members of the said Society, do hereby recommend to the Society as a Candidate.

Members { Proposer

Seconder